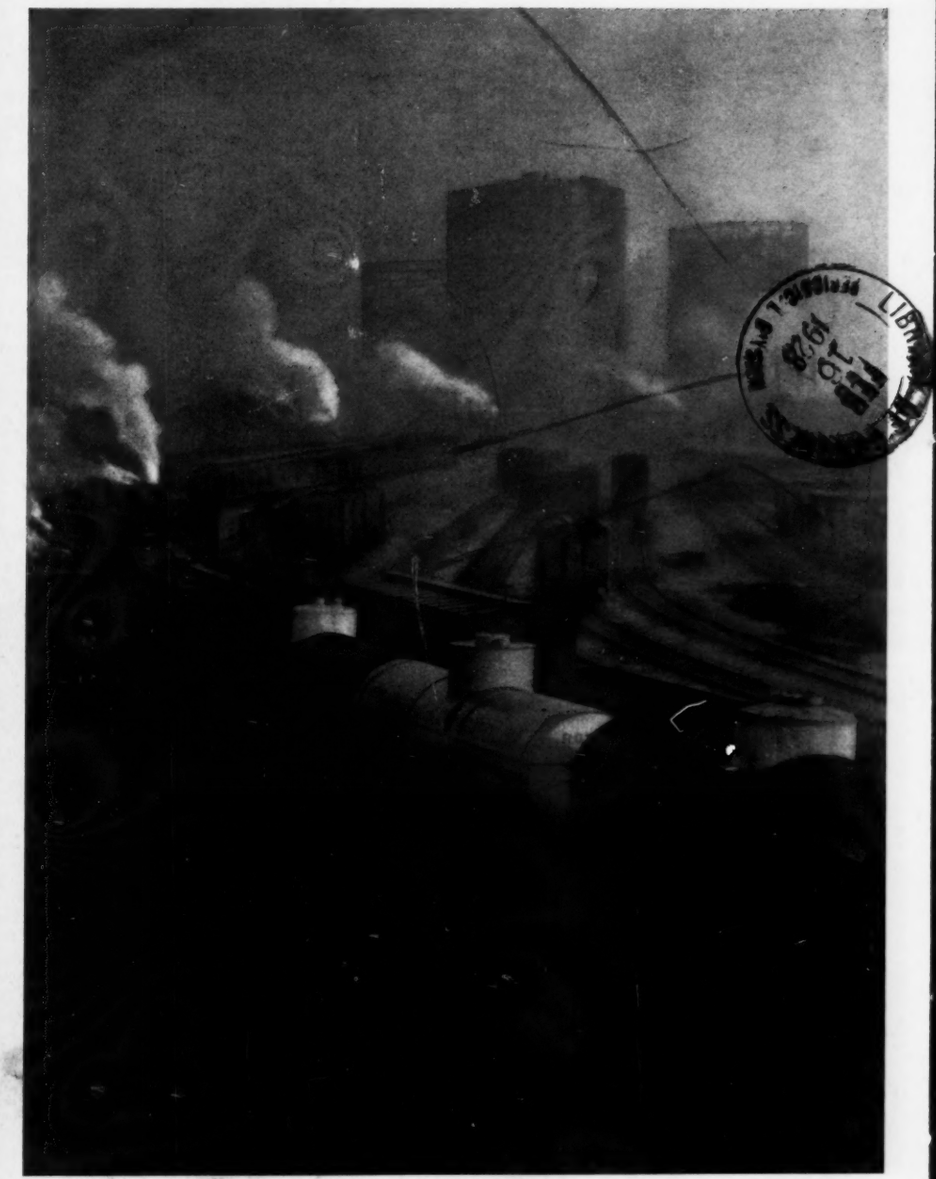
WESTERN GAS

ebruary
1928

20c Cents
the Copy



WHERE GAS LOOMS LARGE ON THE INDUSTRIAL HORIZON

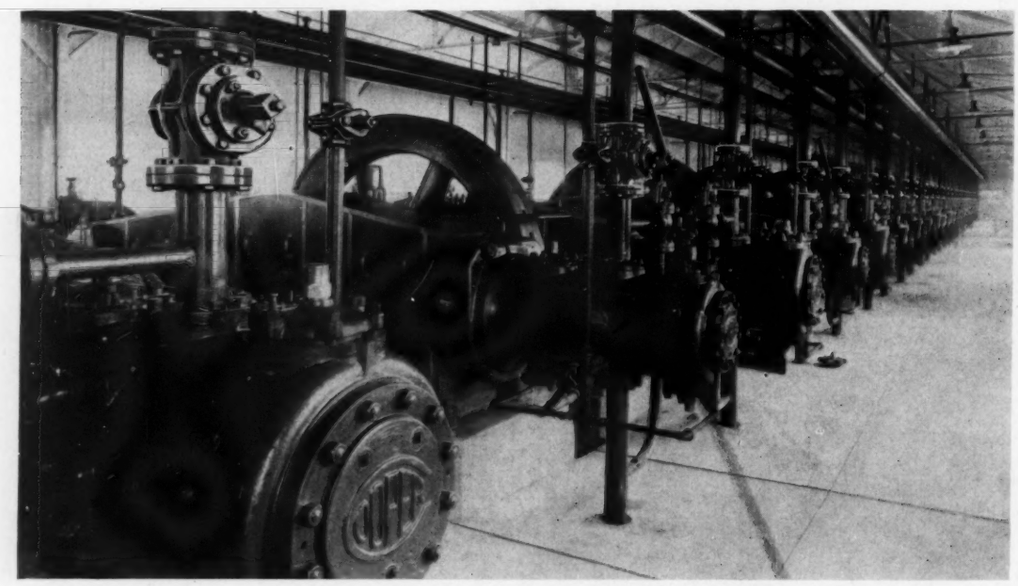
A MONTHLY JOURNAL DEVOTED TO THE
WESTERN GAS & APPLIANCE INDUSTRIES

PRINT IN BINDING

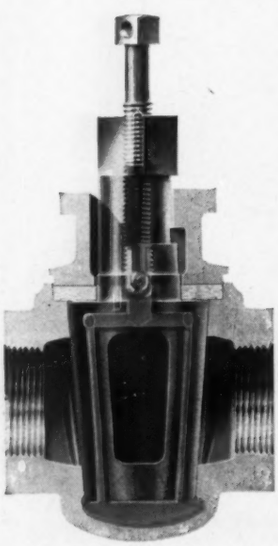
Nordstrom Valves

prevent leaks on high compression lines

MERCO
TRADE MARK



COMPRESSION plant operated by a gas company, showing 4 Nordstrom Valves on both the high and low stage compressors for handling gas on the intake line. Pressure from 90 lbs. to 110 lbs., under normal conditions and as high as 450 lbs. Nordstrom 2½ Valves also used on water line to jacket for cooling



Successful with high temperatures.

Operate under high or low pressure.

Equally satisfactory on vacuum lines.

No foreign matter can pass the film of lubricant.

No joints or grooves in which foreign matter can lodge.

Quarter turn opens or closes valve.

Non - corrosive metallic diaphragm interposed between plug and packing.

Plug held in its seat at all times. Turning of lubricant screw creates hydraulic pressure up to 2,000 lbs. per square inch.

No mechanical adjustments to seat or unseat the plug.

Each valve lapped in and tested, insuring absolute shut-off within its marked working pressures.

Bottom entirely enclosed.

Made in different types of metals to handle every kind of gas, liquid or slime.

Won't leak—won't stick.

Catalog Upon Request

MERCO NORDSTROM VALVE CO.

SUBSIDIARY OF THE MERRILL COMPANY

Engineers—Manufacturers

San Francisco.....121 Second St.
Cleveland.....Engineers Bldg.
New Orleans.....Masonic Temple Bldg.
Chicago.....Peoples Gas Bldg.
New York City.....11 W. 42nd. St.
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Factories: Oakland, Calif. and Belleville, N. J. Agencies in principal cities

Announcing the Formation of

UNITED ENGINEERS & CONSTRUCTORS, INC.

DWIGHT P. ROBINSON, *President*

Combining

THE U. G. I. CONTRACTING COMPANY
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DWIGHT P. ROBINSON & COMPANY, INC.
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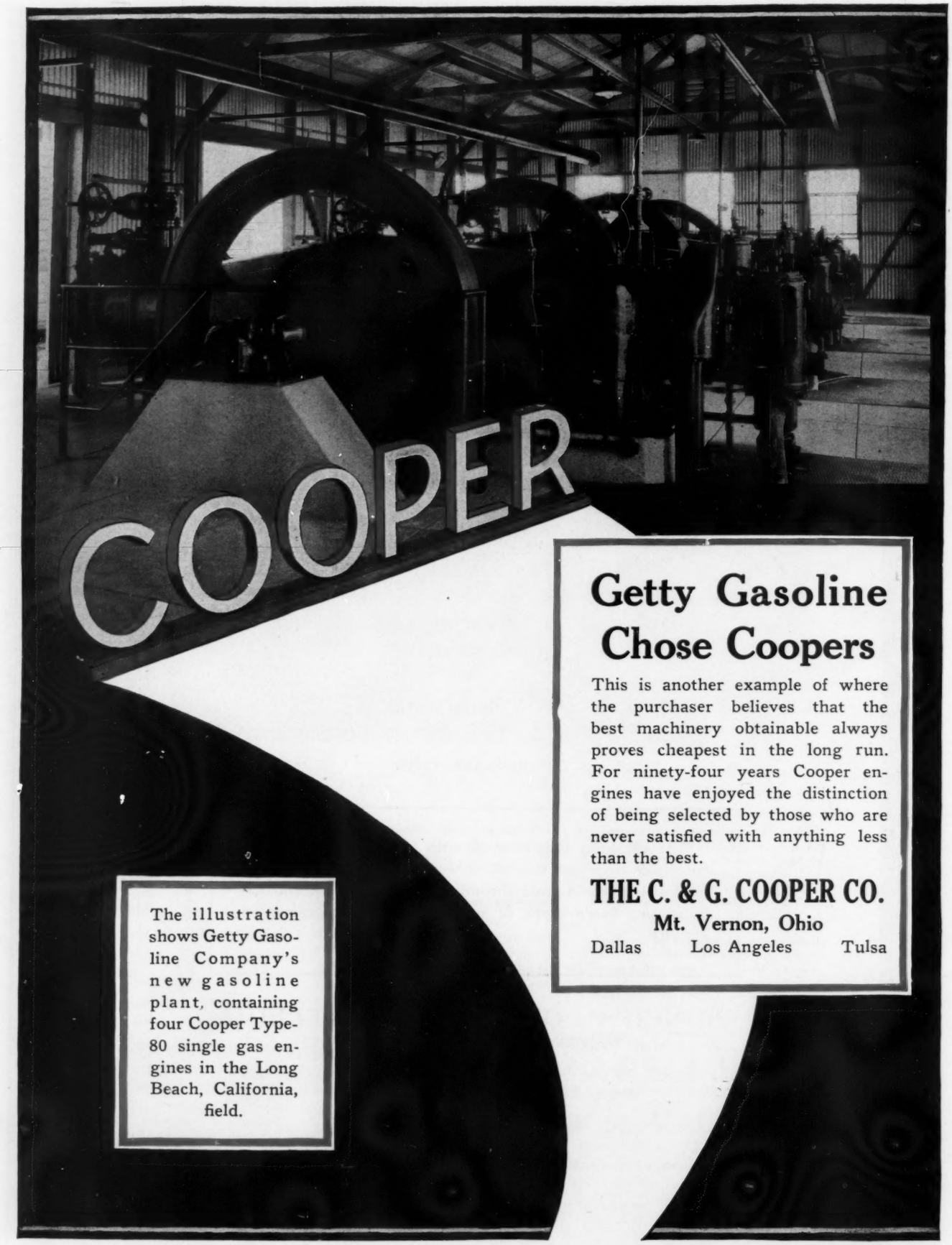
The company thus formed, with a background of over forty-five years of successful work, will operate in any part of the world under broad powers permitting participation in every form of engineering and construction activity.

PRINCIPAL OFFICE—PHILADELPHIA

N. W. CORNER BROAD AND ARCH STREETS

NEW YORK, NEWARK, CHICAGO, LOS ANGELES, ATLANTA, PITTSBURGH,
HOUSTON, MONTREAL, RIO DE JANEIRO, BUENOS AIRES



The illustration shows Getty Gasoline Company's new gasoline plant, containing four Cooper Type-80 single gas engines in the Long Beach, California, field.

Getty Gasoline Chose Coopers

This is another example of where the purchaser believes that the best machinery obtainable always proves cheapest in the long run. For ninety-four years Cooper engines have enjoyed the distinction of being selected by those who are never satisfied with anything less than the best.

THE C. & G. COOPER CO.

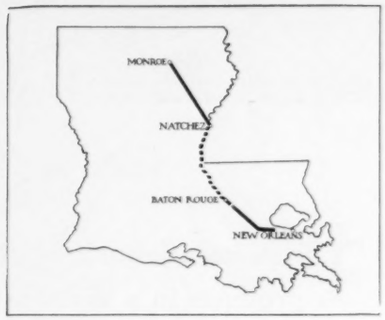
Mt. Vernon, Ohio

Dallas Los Angeles Tulsa

February, 1928, Volume IV, Number 2. WESTERN GAS is published by Western Business Papers, Inc., at 626 South Spring Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; $2.00 per year; 3 years $5.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, California, under the Act of March 3, 1879.

Right: Lowering Away the Coated Pipe, Lily Spur, La.

Below: Coating the Pipe with Biturine Enamel, Gonzales, La.



BITURINE ENAMEL PROTECTS NEW 60 MILE EXTENSION OF WORLD'S LARGEST NATURAL GAS LINE

The Interstate Natural Gas Company in completing the third link of its 230 mile line, running from Baton Rouge, La., to Destrehan, La., specified Biturine Enamel as the protective coating. The first link, also, (90 miles of 22-in. line from Fowler, La., to Natchez, Miss.), was coated with Biturine. Thus Biturine has been chosen to protect 150 miles of the total 230 miles of pipe laid. The engineers in charge of this project are Ford, Bacon & Davis of New York, while the contractors are Williams Brothers of Tulsa.

Buturine Enamel
prevents corrosion permanently

For more than sixteen years many leading oil and gas industry executives have been successfully solving the pipe line corrosion problem with Biturine Enamel—the permanent corrosion preventative. Hundreds of miles of pipe line have been coated with Biturine Enamel and the largest operators in both th oil and gas fields have pronounced it entirely successful in giving permanent protection.

Unaffected by acids,
alkalis or electrolysis

Biturine Enamel is a heavy quick-setting bituminous coating, tough but not brittle. It is applied hot and requires no wrapping. Adheres tightly to metal and will not crack. It is absolutely impervious to corrosive elements.

Biturine Enamel is manufactured by Hill, Hubbell & Company as one of a special line of paints for the oil industry. No skilled labor is required to apply Biturine Enamel.

Valuable, practical data and specifications furnished on request

HILL, HUBBELL & COMPANY

Manufacturers of
Highest Grade Oil Industry Paints and Pipe Line Coatings
Factories at SAN FRANCISCO and TULSA

District Offices:

LOS ANGELES
SEATTLE
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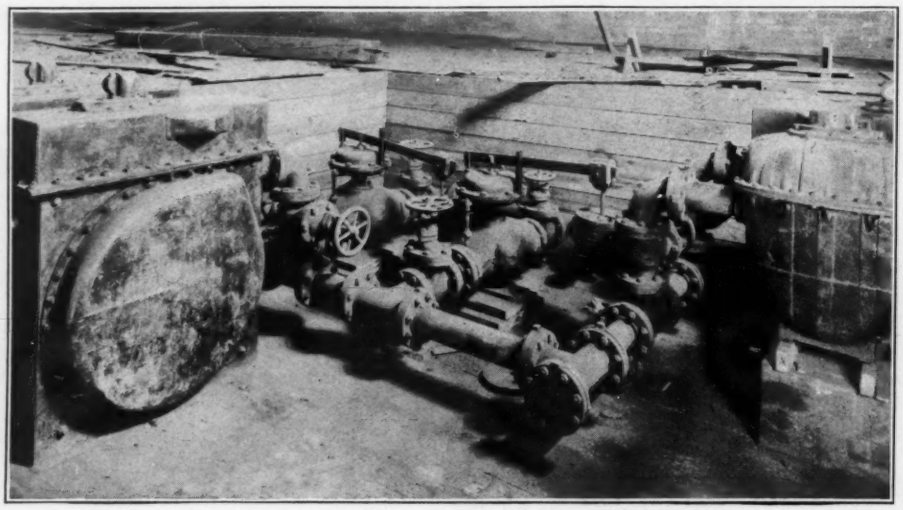
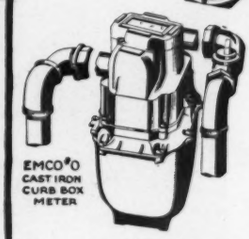


EMCO Products in the Mid-West

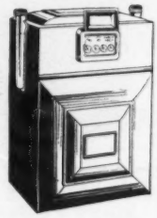
THIS installation of Pittsburgh Equitable Meter Company products in a mid-west foundry is typical of many similar installations. This illustration shows two batteries, one consisting of two Number Five EMCO Pressed Steel Type Meters with a four inch EMCO High Pressure Balanced Valve Regulator, and the other consisting of one EMCO Number Five and one EMCO Number Four Large Capacity Meter with a four inch EMCO High Pressure Balanced Valve Regulator. These two batteries measure 50,000 Cu. Ft. of gas per hour at a pressure of ten pounds at the burners.

EMCO #0 CAST IRON DRY GAS METER

IRONCLAD CAST IRON DRY GAS METER

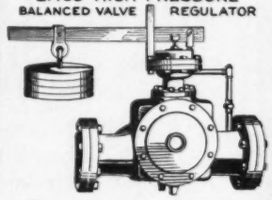


EMCO #0 CAST IRON CURB BOX METER

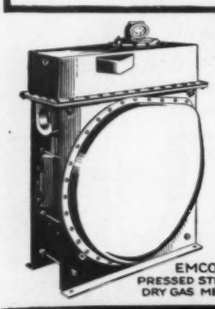


EMCO TIN METER

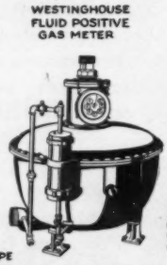
EMCO HIGH PRESSURE BALANCED VALVE REGULATOR



EMCO WATER HEATER AND GAS APPLIANCE REGULATOR

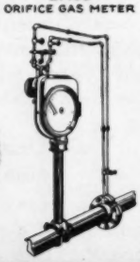


EMCO #5 PRESSED STEEL TYPE DRY GAS METER



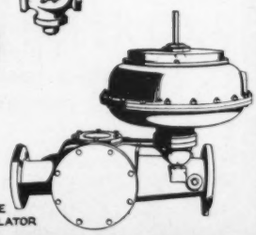
WESTINGHOUSE FLUID POSITIVE GAS METER

EMCO LARGE CAPACITY CAST CASE DRY GAS METER WITH EMCO COMBINED RECORD GAUGE



EMCO ORIFICE GAS METER

EMCO DOMESTIC SERVICE REGULATOR

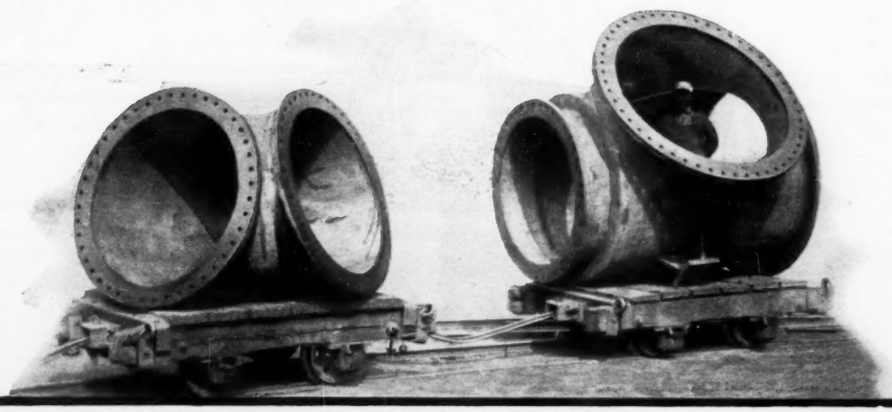


EMCO LOW PRESSURE BALANCED VALVE REGULATOR

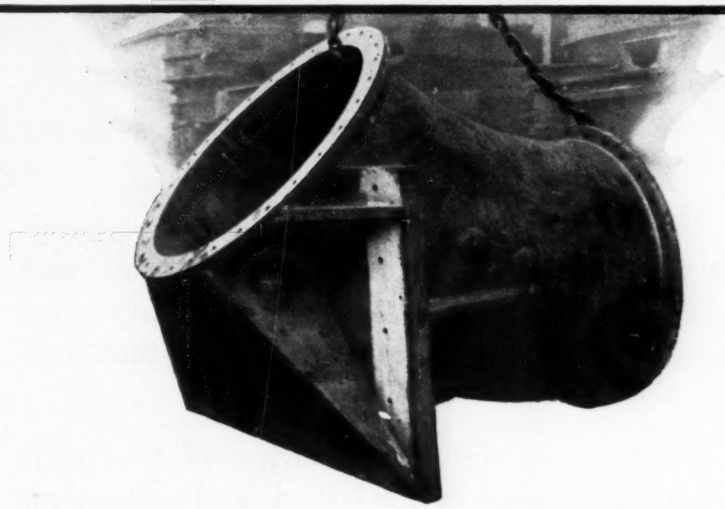
PITTSBURGH EQUITABLE METER COMPANY

MAIN OFFICE AND WORKS PITTSBURGH, PA.

NEW YORK CHICAGO COLUMBIA, S.C. LOS ANGELES DALLAS TULSA SEATTLE KANSAS CITY SALT LAKE CITY

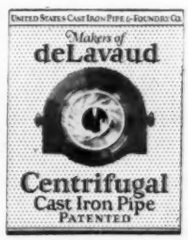


Large standard fittings and special castings



In our various plants we have unusual facilities for handling the largest standard fittings and for making especially heavy castings.

WHILE standard connections should be adopted as far as possible, it sometimes happens that an exception has to be made to meet unusual conditions. When such conditions arise communicate with our nearest sales office. Our equipment is so complete that oftentimes the castings can be designed to fit equipment already available at one of our plants. This saves the cost and lessens delivery time.



United States Cast Iron Pipe and Foundry Company

General Offices:
Burlington, New Jersey

SALES OFFICES

Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 957 East Ferry Street
Cleveland: 1150 East 26th Street
New York: 71 Broadway
San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Minneapolis: 6th St. & Hennepin Ave.

Greetings

A New Year gives to all a new inspiration, new hopes, new determinations to do our tasks better, more worthily, with greater benefits to our industry.

We are grateful for the support rendered this organization, and through this New Year and the years to come, we hope to justify even more fully the splendid confidence that has been shown in us.

With an earnest appreciation of the good will and patronage of our friends and customers, we extend to them sincere good wishes for 1928, and the hope for that wider, deeper prosperity which should ever bless this industry.

Pacific Meter Works

of the
American Meter Company, Inc.
Northwestern Representative

SAN FRANCISCO
495 Eleventh St.

PORTLAND
Northwestern Gas and Electric Equipment Co.

LOS ANGELES
2118 Atlantic St.

NEW ROPER COLOR RANGES

No. 700 R6 T3

HERE'S the biggest sales-making, profit-increasing booster that has come to the dealer in gas ranges in many a year . . . *Roper Color Ranges*—Roper ranges in brilliant, lustrous hues to match artistically into the latest decorative feature of modern homes, the kitchen furnished and equipped even to enamel ware in harmonious tints and shades of one color . . . Roper has produced the one and all important item in kitchen furnishing and equipment to give complete color harmony . . . We have brought forth color ranges — beautifully enameled in four striking colors—Poudre Blue, Imperial Red, Canary Yellow, and Jade Green . . . with this spread of color, Roper has a range to fit harmoniously into any color scheme planned for a kitchen.

Put Your Stock of Ranges in Tune With Kitchen Color Harmony

THIS big innovation in the home means money to you. It will speed replacement of old ranges, and lift the price a customer will pay for a range; for the housewife is buying more than equipment for the kitchen. She is buying beauty for her home.

The demand for color in ranges will soon be on you. If your display does not have color ranges, your patrons will know it is not an up-to-the-minute stock.

Wire your initial order for Roper Color Ranges. The ranges available for display at the start will be limited. Write for the full story of the newest and biggest stride in gas range merchandising history.

GEO. D. ROPER CORPORATION, ROCKFORD, ILLINOIS
Pacific Coast Branch: 135 Bluxome Street, San Francisco, Calif.

ROPER

GAS RANGES
in Color

BLUE RED YELLOW GREEN

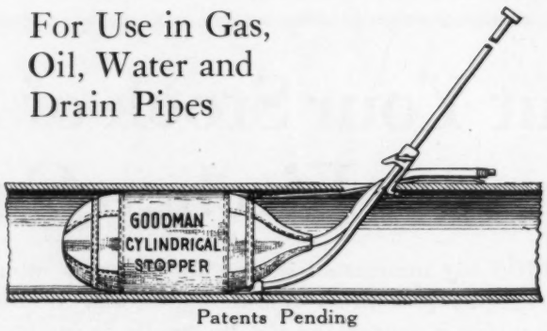
AIR LINE MASK
With or Without
Blower
Mask and Blower
in Separate Cases

Dependable Gas Main Bags--3 Types

Type A—Seamless.
Type B—Reinforced Seams.
Type C—Canvas-Covered for use in mains coated with tar or oil.

Plugs - Main and Service
Pipe Cleaning Brushes
Soap Tape

For Use in Gas,
Oil, Water and
Drain Pipes



Patents Pending

SAFETY GAS MAIN STOPPER CO.

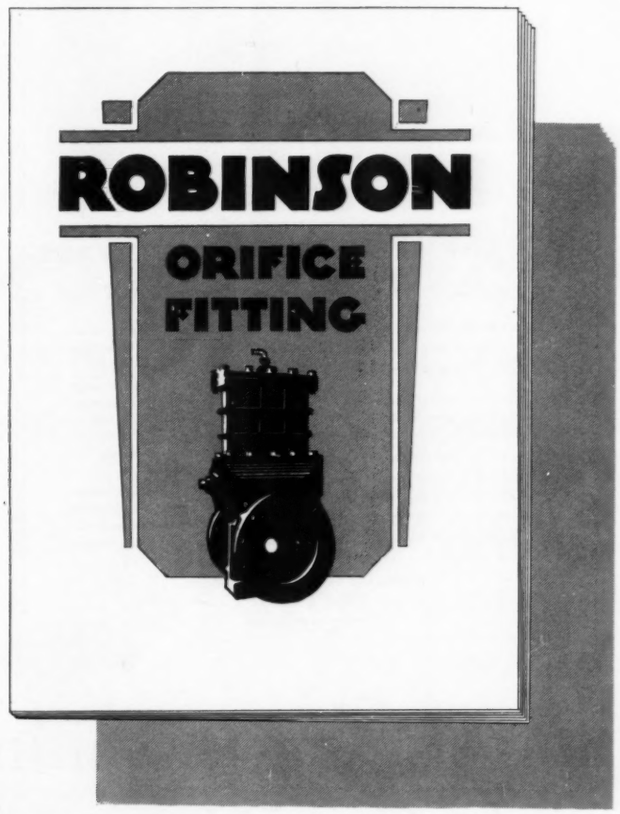
PATRICK GOODMAN, Owner

523 ATLANTIC AVENUE, BROOKLYN, N. Y.

Oklahoma Representative
Circle Corporation
Tulsa, Oklahoma

Pacific Coast Representative
C. B. Babcock Co.
San Francisco, California

JUST OFF THE PRESS



Your Copy is Ready

A NEW CATALOG

of great interest to the gas industry

IF YOU are not familiar with the advantages of the Robinson Orifice Fitting, this new catalog will give you the complete story. If you are, you will want it anyway, as it presents new types and specifications. Your equipment files can not be up to the minute without it. Just fill in the handy coupon below and mail to us to secure your copy.

ROBINSON ORIFICE FITTING COMPANY

1435 SANTA FE AVENUE - LOS ANGELES, CALIFORNIA

California Distributors:

Westcott & Greis, Inc., Los Angeles; Jensen Instrument Co., Los Angeles

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ROBINSON ORIFICE FITTING CO., 1435 Santa Fe Ave., Los Angeles, Calif.,

Send me a copy of your new catalog.

Name..... *Position*.....

Company.....

Address.....

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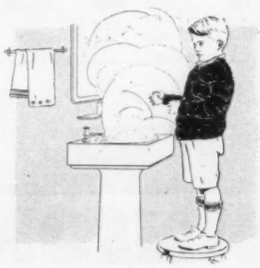


All the HOT water you want —no waiting, no bother

Automatic Storage Gas Water Heater keeps plentiful hot water ready

Isn't it a wonderful convenience to always have plentiful hot water immediately?

Men like their clubs and the hotels for just this reason.

And you can have this excellent hot water service in your own home.

An Automatic Storage Gas Water Heater gives plentiful hot water day and night—deep hot water for bathing, a basinful for shaving. There's no waiting, no bother.

The operating cost of an automatic water heater is low. It raises the temperature of water from 60° to 140° at a cost of about one-fifth of a cent per gallon. This is the lowest cost for heating water in the home.

Details on replacing your old water heater with a modern Automatic Storage Gas Water Heater can be obtained by phoning or calling at our local office.

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned · Operated · Managed
by Californians

204-231

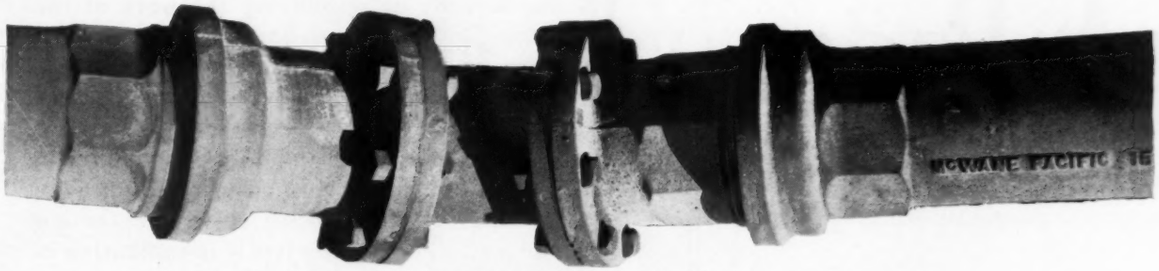
One Million Messages Telling About Automatic Gas Water Heaters

The above advertisement is a reproduction of a 3-column 8-inch message about automatic gas water heaters. It will have a total newspaper circulation in the Pacific Gas and Electric Company's territory of one million.

It shows how no modern home can afford to be without good hot water service—day and night. Especially when the cost is so reasonable.

This is part of our program mapped out this year to help everyone sell good gas appliances.

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned · Operated · Managed
by Californians



6-inch high pressure McWANE-PACIFIC threaded-joint Cast Iron Gas Main.

Unaccounted-for Gas—

Now you can watch that figure drop! Get rid of leaks, corrosion and the costly bother of coating, wrapping and coddling your gas mains by using McWANE-PACIFIC male-and-female-threaded joint CAST IRON gas pipe. As small as $1\frac{1}{4}$ and 2 inches; as large as 6 inches; it's the answer to the gas industry's efforts to secure a rust-proof pipe with gas-proof joints.

Male-and-female-threaded Adapters for inserting flanged fittings and valves in 4-in. and larger McWANE-PACIFIC threaded-joint Cast Iron mains.

It is in actual service all over the country now, holding the gas under high pressure or low. Tight, simple, economical. Flexibility of installation afforded by the Adapters shown above.

Insure yourself against leakage and pipe replacements as you do against fire —use McWANE-PACIFIC Cast Iron Pipe. Western-made for the western trade.

Write our nearest office for the full facts and prices before you lay another foot of perishable pipe.

PACIFIC STATES CAST IRON PIPE COMPANY, Provo, Utah

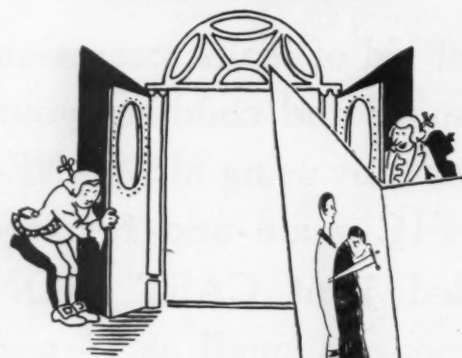
608 Subway Term. Bldg. LOS ANGELES, CALIF. | 611 Spalding Bldg. PORTLAND, OREGON | 149 West Second South SALT LAKE CITY, UTAH | 922 Hunter-Dulin Bldg. SAN FRANCISCO, CALIF.

Affiliated with McWANE CAST IRON PIPE CO., Birmingham, Phila., Dallas, Chicago

"What the West Makes, Makes the West"

A Page from

WELCOME MEMBER



IN the interests of simplifying the work of the gas company, Welsbach has created an unusual instruction card for the purchasers of the Hotzone Self Action Water Heater . . . In a good natured way the folder acquaints the new owner of a water heater with the "do's and dont's" of operation. Already this little folder has aided in the general work of making well-satisfied customers for gas companies . . . The idea itself is indicative of Welsbach's continuous effort to aid its customers in reducing sales resistance and increasing good will. Samples of "Welcome, Member" will be gladly sent on request. Welsbach Company, San Francisco Office: *863-865 Mission Street*

Member of American Gas Association
Member of Pacific Gas Association

The Reading of the By-laws

As this is a family membership, it is recommended, in the interest of perfect satisfaction, that the family treasurer read aloud to the newly initiated the following by-laws. And thereafter seek their unanimous adoption.

1. No member shall turn on the hot water faucet when cold will suit his purpose just as well.
2. All members shall see that the hot water faucets are turned off tight after using.
3. Any member who discovers a leaky faucet shall report the same to the family manager immediately.
4. All members shall mix cold water with the hot in order to get the right temperature instead of drawing twice as much hot water and then waiting for it to cool.
5. Any member breaking the above rules shall be immediately demoted to the end of the bathroom line.

The **WELCOME MEMBER** *folder is attached to every* *Welsbach*

HOTZONE

SELF ACTION GAS WATER HEATER

Famous Chefs Endorse Smoothtop

Wide warming shelf . . . . . .

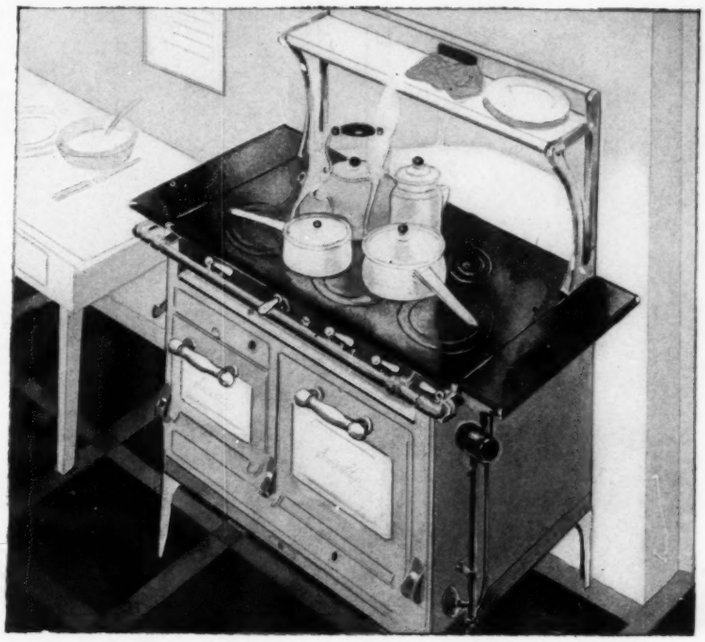
All of Smoothtop is cooking surface

4 kettles can cook on 1 burner . . . .

Pilot light . . . . .

3 heats—boil, simmer, warm . . . .

Smart, modern designs . . . . . .



Convenient height —38" from floor . .

Standard heat control . . . . . .

Well-designed separate broiler . .

Even heat through out large oven . .

Strong-hinged oven doors act as loading shelves . .

Beautiful, durable finish . . . . . .

WHERE can you find a more particular cook than a chef? He demands a range that will help him to get the best cooking results with the least amount of work. He gets it in the Vulcan Hot Top range, used by famous chefs everywhere.

Smoothtop is the household model of the Vulcan Hot Top hotel range. Famous chefs such as Diat, Godard, Maxime and Theophile have inspected Smoothtop and given its cooking method their enthusiastic endorsement. The statements of these and other noted chefs will be published in full page advertisements every month in Good Housekeeping Magazine, reaching over 1,500,000 women.

This campaign is going to have a powerful effect on the range buying habits of women. You can enjoy its benefit if you want to.

A STANDARD OF STANDARD GAS EQUIPMENT CORPORATION

Northwest Gas and Electric Equipment Co.

Pacific Coast Distributors, Standard Gas Equipment Corp.

Public Service Bldg.
Portland, Ore.

2nd & Brannan Sts.,
San Francisco, Calif.

164 So. Central Ave.
Los Angeles, Calif.

Smoothtop
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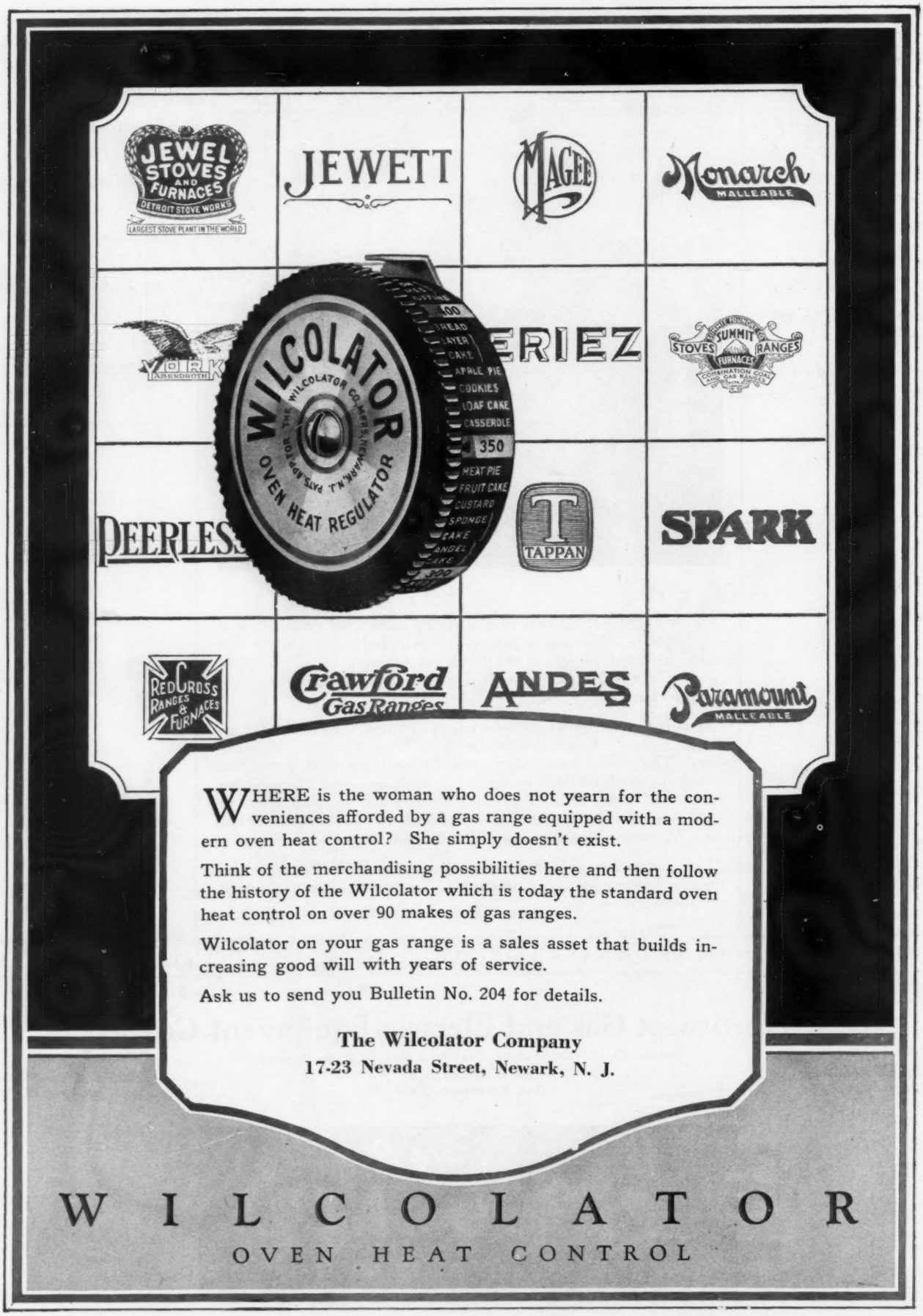
GAS RANGES



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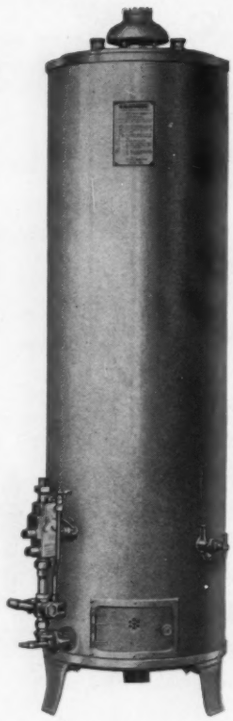

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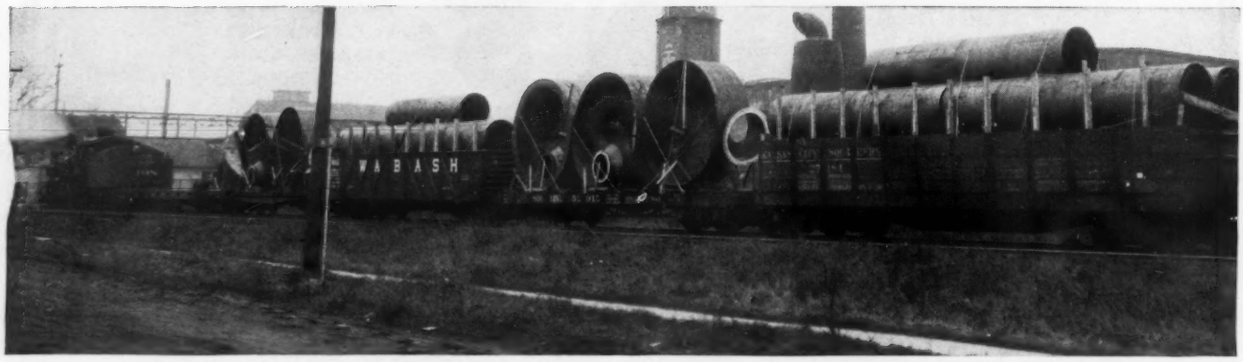

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WESTERN GAS

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

SAN FRANCISCO · LOS ANGELES · DALLAS

P. C. G. A. Survey Shows Coast Growth *to be* Above National Average

By CLIFFORD JOHNSTONE
Executive Secretary Pacific Coast Gas Association

Clifford Johnstone

IN his splendid address before the last convention of the Pacific Coast Gas Association, Prof. J. Hugh Jackson of Stanford University said that statistics formed one of the most useful tools of management and that an important function of the trade association was the collection of such statistics as might prove useful to its members.

The gas industry looks to the American Gas Association for a record of its national growth and preliminary figures of 1927, reported in the January issue of the A. G. A. Monthly, show that our total annual sales have reached a new high record of 475 billion cubic feet, an increase of nearly 5 per cent over 1926 and 36 per cent over 1922.

COAST IS ABOVE AVERAGE

It will interest Pacific Coast gas men to contrast this with the growth in our own section as shown by figures gathered by the Pacific Coast Gas Association. Table No. 1 shows the sales, customers and revenue of 20 representative Pacific Coast gas companies for the past six years and indicates that our growth is well above the national average. The very small increase in cubic foot sales in 1927 over 1926 is accounted for in Table No. 2, which is a record of the 1926 and 1927 operations of 27 companies, including those represented in Table No. 1. An inspection of Table No. 2 shows that all sections of the Coast had a healthy growth in cubic foot sales with the exception of the natural gas territory in Southern California, which experienced a decrease in cubic foot sales of 3.8 per cent. This in itself is a remarkable achievement when it is remembered that the gas served in 1926 was largely mixed gas of 850 B.t.u. heat content per cubic foot and the gas served for 11 months of 1927 was all straight natural gas of approximately 1100 B.t.u. per cubic foot. The southern companies have taken on nearly enough new business to compensate for the 15 per cent decrease with which they were faced because of the increase of heating value.

There is every indication that gas companies have awakened to the fact that it is essential that gas appliances be sold if the domestic consumption of gas is to be materially increased. The majority of Pacific Coast Gas Companies are more or less active in selling Blue Star gas appliances and those making no sales are fortunate in having aggressive retailers in their territory. Some

(Continued on Page 33)

TABLE NO. 1

SALES, CUSTOMERS AND REVENUE OF 20 PACIFIC COAST GAS COMPANIES

Year	M.C.F. Sales	Per cent of-1922	Active Meters	Per cent of-1922	Gross Revenue	Per cent of-1922
1922	60,641,118	100	920,081	100	41,526,736	100
1923	77,716,433	128	1,051,173	114	44,017,051	106
1924	89,095,851	147	1,113,609	121	49,805,976	120
1925	95,602,424	158	1,202,906	131	53,630,444	129
1926	96,756,842	159	1,292,127	140	57,634,496	139
1927	96,841,483	160	1,366,166	148	65,328,757	157

The companies represented in this table include one in Arizona, 11 in California, 4 in Oregon, 3 in Washington and 1 in British Columbia.

LEFT: Kitchen in model home recently opened on lines of The Peoples Gas Light and Coke Company, Chicago, Illinois.

BELOW: Exterior view of the same model home.

This Plan Sells Gas *to* Entire Subdivisions

By GEORGE H. FINLEY

MOST gas companies have found the so-called speculative builder a hard nut to crack—particularly in fast-growing Western communities in which the cost-saving, quality-sacrificing "middleman" in the residence market is a too familiar figure. The problem largely resolves itself into so completely selling the public upon the merits of quality gas equipment and upon the desirability of a complete gas service in the home, that the profit-seeking builder must fit his units with good and adequate gas merchandise in order to sell them.

But this indirect method, which depends upon the backfire of popular demand to bring the speculative builder to terms, is at best a slow process, though a necessary one in any far-sighted merchandising program. Builders will always be prone to install the cheapest appliances, and the fewest to the individual home, that they can—and still be assured of a sale at their price.

DIRECT PRESSURE NEEDED

With this condition to face, the gas company new business department is naturally bringing all possible pressure to bear direct upon the builder, while spreading the educational leaven for more and better appliances broadcast in its territory. Several effective forms of "direct pressure" have been developed, and one of the most complete of these is at work on the lines of The Peoples Gas Light and Coke Company, Chicago, Ill.

In Chicago there was even more reason than the ordinary desire to see the domestic load keep pace with city growth behind the gas company's campaign on speculative builders. Chicago is a city of apartments—yet 75 per cent of The Peoples Gas' apartment business is carried at a loss, or at best at a dubious profit. Therefore, reaching the individual home is the only salvation for the domestic situation, and the new business department of the utility went to work to produce a plan with which to reach the speculative market in single family dwellings.

The company went first to the builder whose subdivision development was located in a section where ground value was somewhat above the average. Naturally, the prospects for the homes which would go up in such subdivisions would be most appreciative of refinements in gas equipment.

To such builders the company presents its proposition — $1500 in gas equipment in the home, in return for certain inducements offered the builder. This investment of $1500 is to include a range, a gas refrigerator, a central heating plant (boiler or furnace), an incinerator, automatic water heater, complete fireplace equipment, a laundry stove—and one optional feature, a laundry dryer, ironer and washing machine to be installed in the first home of the development, and to be retained in the balance if so desired by the builder. These pieces of laundry equipment are the only optional items.

Asking speculative builders to finance $1500 in gas equipment is a big order. It is a staggering thought to the builder who had been guilty of the usual skimping on gas outlets and equipment. It calls for something equally impressive from the gas company, and The Peoples Gas Light and Coke Company is ready with the following terms:

THE COMPANY'S PROPOSITION

The company agrees to build a model of the "all gas" subdivision, and to install this model in one of its display windows at the Chicago general office (see illustration on opposite page). This model will be accompanied with cards drawing attention to the subdivision, and to its complete gas fittings.

The company agrees to place billboards in the vicinity of the subdivision pointing to the property, and primarily playing up the builder and the development, merely mentioning the gas service as one feature of the general excellence of the homes.

One-half page of advertising space in city newspapers of general circulation will be taken for the builder by the gas company, the copy to run in a Sunday issue. Copy will be prepared by the gas company for the builder's approval, or may be prepared by the builder if he prefers this method.

Cost of four typical insertions in the classified "house for sale" column of city dailies will be covered by the gas company, the builder to set the dates for the appearance of these advertisements.

One-half page of display advertising will be run at the gas company's cost in a neighborhood newspaper to be selected by the builder.

The builder will be accorded the privilege of broadcasting a description of his property through "The Peoples Gas Gazette," the company's consumer medium, which is mailed monthly with 850,000 gas bills. This naturally represents the most accurate and comprehensive direct-mail list that could possibly be secured. (One interesting "wrinkle" in connection with these direct-mail efforts is the enclosure of a "permit to view" slip with the gas bill. Such a slip was used with good results during a recent opening of a Blue Star home on the company's lines.

"Peoples Gas Club News," the company's house organ to employees, will also carry one feature write-up on the all-gas subdivision. With current financing of homes extending over a ten to fifteen-year period the properties in question are in many cases well within the reach of the company employees, and prospects might be expected to result from this favorable publicity.

The company agrees to furnish the builder designs and plans for basement layouts, to help him utilize the basement space attractively and to the best advantage. Incidentally, the company can be assured that provisions for gas installations are the best obtainable. Inasmuch as one-third the residence building cost in Chicago goes into the foundation, this basement planning service is a genuinely valuable inducement.

The company further agrees to have a salesman on the job during the entire period of the subdivision's sale, to help sell the superior gas equipment idea to the prospects.

All of these gas company stipulations are conditional upon the builder insulating his homes adequately so that gas fuel costs might be kept at an absolute minimum, with the further appeal that the buyer will be assured a cool home in summer. Builders entering into the gas company program sign a contract to insulate, using insulating material manufacturers' specifications. Obviously the company is accorded the ready co-operation of manufacturers of these materials. Gas company officials, in stressing the need for insulation, state that through this precaution a saving of 20 to 30 per cent—nearer 30 than 20 on well insulated homes—may be made in fuel costs for house heating. Also, the tempering of summer heat through insulation is seen as an entering wedge for the gas refrigeration salesman.

The builder, then, by written contract is held to insulating the home, and installing a minimum specification of six major appliances. By written agreement the gas company pledges itself to supply the forms of co-operation listed in preceding paragraphs, and with the contract goes the gas company's assurance that further support, beyond the rigid terms of the contract, will be forthcoming if need for it develops, to make the subdivision sale a success. In convincing the builder that his gas-equipped homes will not be drugs on the residence market, the company representatives point out that his interests will be identical with those of the utility—each has as much at stake as the other in the undertaking. The prestige of the gas company will suffer if the homes remain unsold. Hence the gas company cannot afford to quibble or count pennies if the co-operation outlined above proves insufficient to the purpose. More inserts in gas bills will be circulated if the cause demands it. More newspaper advertising, more sales assistance, is available if the gas equipped homes move more slowly than anticipated.

This model of a completely gas equipped subdivision in Chicago is on display in The Peoples Gas Building on Michigan Boulevard.

A little thought shows why the gas company's efforts are so varied and liberal in behalf of the "all-gas" home projects. When the company's above terms have been accepted by the subdivider and the homes are erected—what has the utility accomplished?

In the first place, it has put $1500 in quality gas equipment into well-constructed homes, forestalling competitive fuels. This has cost the company nothing in carrying charges on merchandise, for the builder has his own arrangements for financing the homes and their furnishings. The gas company can get 70 per cent of its money 10 days after installing the appliances—and the balance in 30 days.

Whether the company could sell the individual home owners the same degree of gas service, with the considerable investment involved, is problematical to say the least. Under the builder's plan the fortunate owner can buy a superlative gas service on 10 to 15 year payment terms, as he pays for his home, and the gas company is not carrying the load on the deferred payments.

Another favorable element in the plan,

(Continued on Page 59)

Firing Ornamental Terra Cotta

By LEE HOLTZ

Part VI *in an* Industrial Utilization Series*

LEFT: Artistic entrance way, in dull finish terra cotta.

IN a preceding article of this series the manufacture of structural terra cotta was only touched upon for the reason that the methods involved in the fabrication and burning are much the same as those employed in the production of clay wares of similar nature, which processes have already been described. However, before leaving this subject, something should be said regarding the manufacture of ornamental terra cotta.

This class of ware is of a very fine quality and has been used in the arts for countless centuries. Its durability makes it ideal for either in- or out-door decorative purposes and it is used extensively for architectural ornaments, statues, vases, etc. It may be obtained with a glazed or unglazed finish, suitable to one's taste and to meet with any particular requirement.

A very popular finish today for garden pottery and some interior decorations is that of weathered sand stone. This particular finish has the advantage of harmonizing with any surroundings. Garden pottery is also made in many varied decorative color schemes and can be obtained highly glazed.

Terra cotta for building purposes, whether plain or ornamental, is generally made of hollow blocks formed with webs to give extra strength and keep the work true while drying. This is necessary because it is difficult to produce well burned terra cotta safely when more than about one and one-half inches thick; whereas when required to bond with brick work, it may be at least four inches thick. It should, however, be made heavy enough to carry both its own weight and its share of the wall load. A solid one-foot cubical block has been known to bear the crushing stress of more than 500 tons (Kidder).

There is probably no other branch of the ceramic industry where the details of manufacture could be of more interest to the average layman than in the ornamental terra cotta department. Therefore, an attempt will be made to describe the process somewhat in detail.

The origin of the design for building work and garden pottery is usually created by an architect or some one of artistic temperament especially trained in applied design. In many cases the thoughts are of a modern origin. However, some of our most beautiful displays today are copied from the Italian Renaissance period, and from the Egyptian and ancient Grecian architecture, such as characterized the bas-reliefs for the adornment of friezes in old temples, pretentious entries of fine cathedrals, business buildings and homes.

A detailed lay-out is then made by the architectural draftsman and after approval is sent to the modeling department where highly skilled sculptors or modelers (as they are more often called) proceed to shape by hand from a very plastic clay, the design, which on paper is a series of lines and scrolls.

After the model has been completed, which often takes days to accomplish, a plaster Paris cast is made from it. The plastic fire clay material which is to be the body of the finished article is then pressed by hand into the impression made in the plaster Paris cast. Some designs are modeled allowing ample draft so that the product can easily be removed from the cast after the proper shrinkage has taken place. In other cases where under cutting and body indentations are necessary in the modeling, the cast must be put together with loose pieces in order that after it has absorbed some of the moisture of the clay and the desired shrinkage has taken place, it may be taken from the cast in pieces, allowing the product to be removed without harm to the drying floor.

After drying, the pieces are then dipped or sprayed with a vitreous slip which is nothing more than a clay wash containing feldspar which has the same shrinkage as the body. This coating or facing closes the pores of the exposed surface, preventing the absorption of moisture and weather stains. Oftentimes, depending upon the requirement, the ware is fired with only the slip application. If the ware is to be highly glazed, the glazing material is sprayed on over the slip by a hand spraying apparatus and the product is then ready for firing.

Usually for firing glazed ware, the round down-draft muffle wall kilns are used, with a loading capacity of from 25 to 90 tons of material. The muffle type kilns have been and in many localities still remain the most popular type for burning glazed terra cotta, for the reason that the material under fire is somewhat fortified against any attack from the products of combustion, due to an inner wall which completely surrounds the ware.

Up until the past few years, wood, coal and oil were the only fuels used in the clay burning industry and because of the difficulties experienced in the handling of these fuels, every precaution was found necessary to insure a uniform product. However, since the use of gas for the firing of clay products has become so efficient and popular among the many clay manufacturers, the use of muffle kilns is no longer thought to be necessary as an essential requirement in the burning of terra cotta.

Lee Holtz

The difficulties found in the use of the heavier hydro-carbon fuels is that in an effort to completely gasify the fuel, poor combustion is experienced. Incomplete combustion is the cause of a great many failures in producing a good grade of product and requires careful observance throughout the firing period with any fuel.

Gas, and particularly natural gas, has exceptional qualities as a fuel for the manufacture of clay wares, especially that which is to have a glazed surface.

Natural gas is a mixture of free hydrogen and hydro-carbons, though there may be at times a small percentage of

**Installments in Mr. Holtz' able series of articles on gas use in the ceramic industry are appearing in alternate issues of WESTERN GAS. The author is assistant superintendent of distribution for the Southern California Gas Company.*

the hydro-carbons in combination with oxygen. The following is an analysis of natural gas as sold in Southern California:

CO_2	O_2	CH_4	C_2H_6	N_2	B.t.u.	Gravity
0.7%	0.0%	84.0%	14.8%	0.5%	1107	.680

The advantages are as follows:

First: The fuel is delivered to the customer's burner under any pressure desired, ready for use.

Second: Since it is composed of the lighter hydro-carbons, the flames and kiln temperatures are more easily controlled.

Third: A reducing atmosphere, which robs the material of its necessary oxygen, is less apt to be had.

Fourth: Discoloration is practically eliminated, which means that re-glazing and burning is seldom found to be necessary to duplicate a color and complete a delayed order.

Fifth: Sulphur content is low, natural gas rarely containing more than a trace.

Sixth: It is exceptionally clean.

Seventh: The ware may come in contact with the products of combustion without injury.

While in some instances color attainment is produced by flashing, most of the terra cotta ware made, and particularly glazed products, are not dependent upon this means.

THE "FLASHING" PROCESS

By many, the process of flashing in all its variations is not fully understood; therefore, a word or two regarding it may be of interest.

An unglazed terra cotta bas-relief insert

In many instances flashing might be included as a burning period, since it takes place in the final operation of the burning period. The purpose of flashing is to produce a color effect different from that which naturally results from ordinary burning. A flash color on red burning wares is brown to gunmetal black; on buff burning clays from golden yellow to brown is produced. Intentional flashing is accomplished by closing the fires toward the finish of the burn, thus shutting off the secondary air, resulting in a strongly reducing kiln atmosphere. The reducing action of the kiln gases will usually convert the iron minerals into ferrous oxide. The iron in this state readily enters into a silicate combination producing a brown to black ferrous silicate. Flashing is really a flame phenomenon and is presumably due to iron.

The common method for performing this operation when certain requirements make it necessary is to begin 10 to 15 hours before the finish of the burning. The fires are closed for a period of two to six hours, followed by a longer or equal period of clear fires and the alternations are repeated until the end of the burn.

If flashed ware is cooled very quickly, the flashed color does not always appear, at least not as brilliant as wanted. Slower cooling within reasonable limits is considered best. However, this is merely a question of oxidation.

In some cases where flashing occurs on a fire clay product such as terra cotta, and is not wanted, it can be burned off in part at least by reburning the ware under oxidizing conditions.

The process of manufacture has considerable effect on the flashed color and only rarely can the same color be produced on the same clay ware made up by different processes. Many dry press products have a beautiful golden flash, while the stiff mud products from the same clay lack the golden color and are often dull brown. However, there are many good flashed stiff mud products manufactured.

The main requirement for flashing fire clay bodies is the presence of carbon as the surface of the pieces fired absorbs carbon, producing the desired color. It is thought by some a difficult matter to flash with a gas fuel. However, this is not the case as the primary and secondary air can be entirely eliminated if necessary.

At the present writing, the writer has very little data on firing time and gas consumption on terra cotta burning without the use of the muffle wall However, it may be of interest to note a test recently made by the Kansas City Gas Company and described in the January number of the American Ceramics Society Journal, in which terra cotta ware was burned without the use of the muffle wall. Ten thousand cubic feet of 1000 B.t.u. gas was necessary to burn 30 tons of material to 2245 degrees F. in 55 hours time.

Glazed terra cotta frieze

As a matter of comparison, a test conducted on the Southern California Gas Company system on a muffle wall type kiln shows a gas consumption of 17,000 cu. ft. of 1020 B.t.u. gas per ton of ware fired to 2155 degrees F. and a firing time of 115 hours for 65 tons of material.

The information here given regarding fuel consumption and burning time will not be of much value to the reader by reason of the fact that materials, operating conditions and the classes of ware made vary so greatly. Nevertheless, it will give some idea for rough calculation.

TUNNEL KILNS FAVORED

No doubt within the next few years direct fire car tunnel kilns will replace the present type of kiln for the firing of all kinds of terra cotta ware, owing to the appreciable reduction in firing costs. The writer is acquainted with one firm which fires garden pottery by this means and finds that the ware is of extra fine quality. However, at this time no comparison can be made as to cost as the pieces are being fired along with another kind of ware.

FEATURES OF THE NEW PUBLIC SERVICE BUILDING, WHICH NOW HOUSES PORTLAND UTILITIES

Left to right: (Top row) Portion of gas display room—Exterior, night view—Cashiers' desks. (Bottom row) Gas display room—Corner of auditorium—Lunch room.

A Monument *to* Public Service *in* Portland

THE Public Service Building, constructed to house the offices of the Portland Gas & Coke Company, the Northwestern Electric Company and the Pacific Power and Light Company, at Portland, Oregon, was officially opened January 3rd. These companies, however, moved their activities to the new building Saturday and Sunday, December 17th and 18th, and have been doing business there since Monday, December 19th, 1927. They occupy the first, second, third, fourth, fifth, sixth, seventh, eighth and fifteenth floors of the fifteen-story structure, the remainder of the building being given over to office tenants.

In style the new home of the Portland utilities is an adaptation of Italian Renaissance architecture. A triumph of exterior proportion has been secured, as is evident in the view shown above, the happy combination of beauty and dignity being achieved through what has been well termed "a simple and straightforward use of material and masses." A Florentine cornice and a two-story colonnade crown the central shaft of the building. The exterior color is gray, the roof varies from orange to burnt sienna.

The building has an overall height of 259 feet, and contains 227,000 square feet of floor space.

Surmounting the structure is a large four-sided Neon sign which is visible over a large part of the city, the sides reading "GAS", "POWER", "LIGHT", and "HEAT", respectively.

Convenience of the ground floor arrangements is one of the outstanding features of the building from the standpoint of the customer. The lobby is located in the center of the Sixth Street side of the building and the south half of the floor is occupied by the Portland Gas & Coke Company as sales and display rooms, the Northwestern Electric Company salesroom occupying the north half. The combined information and cashier's desks occupy the space behind the elevators, opening into both salesrooms.

The construction of the cashier's desks represents a departure from the usual cage type. They are housed behind a marble wall about shoulder high, in which there are apertures where the customer transacts his business.

The ground floor can be reached by three entrances. The main entrance is through the lobby, which has a high vaulted Florentine ceiling and is finished in Italian marble. There are also entrances direct to the salesrooms and Cashier's desks on both the Taylor and Salmon Street sides of the building.

Signal-controlled elevators which travel 800 feet per minute serve the fifteen floors of this building, stopping automatically at the desired floor level.

The mezzanine floor, which extends around three sides of the sales and display rooms, is devoted to offices for salesmen, clerks and executives connected with the sales departments of the two companies furnishing service in Portland. The second floor is occupied by the combined customer contact offices of the two companies. Here contracts are made, collections adjusted and other matters taken care of which require more time than the mere payment of a bill. Booths are provided where customers whose business requires much time or attention, can be made comfortable. This floor also houses the telephone equipment, consisting of a complete

(Continued on Page 59)

Economical Means *of* Increasing Peak Load Capacity

By R. R. RIPLEY
*Portland Gas and Coke Company**

SO much has been said in the past regarding the effects of peak load on the economic production, distribution and utilization of city gas that the necessity of preparation for such loads is pretty thoroughly understood. This subject was covered very completely in E. L. Hall's paper on "Gas for Peak Load Conditions."** In this is given as a typical illustration the requirements of Portland, Oregon, where the daily peak load, with 10 per cent of the total consumers househeating customers, is approximately two times the average daily load. This requirement in other cities will vary largely with weather conditions and is well brought out in "A Reference Book on the Application of Gas to Househeating" published by the American Gas Association. Attention, however, is called to the wide variation in temperature for short periods over a day or more compared to the average monthly or seasonal periods. In Portland while the average mean winter monthly or seasonal temperature is about 40° F., the minimum mean daily temperature has been as low as 6° F.

The scope of this committee will be the study of the most economical means of increasing the capacity of production and distribution equipment to handle the variations brought about by peak loads. Suffice it to say that those companies that expect to expand their systems to take care of the househeating peak, who utilize every possible means of investment economy consistent with good service during such growth, should be in the better position to take on the largest percentage of such business at a profit. This applies to the investment for the average or base load as well as to the investment for peak load, due to the continuity of investment charges.

Among those methods of decreasing the investment cost the one most widely discussed perhaps is the proper quality of gas for peak load. Mr. Hall showed in his paper published in the 1926 Proceedings that Pacific Coast oil gas was admirably suited for this, due to its relatively high B.t.u. and low specific gravity, and that oil, even at twice its present price, would still be in the running; that companies already having oil gas plant investment could continue with such equipment at still greater increased oil price.

The bulk of oil gas manufacture is carried on by two processes which may be designated the one shell and the two shell methods. For peak load periods the one shell gas carries the lower investment charges and the higher manufacturing cost, while the two shell carries the higher investment and lower manufacturing costs. This statement is generally made considering that gas is the main consideration at the extreme peak requirements and that the manufacture of by-products may be minimized at such time. Considering the particular location it is therefore a problem of determining the economic proportion in which the investment in the two processes should be made. Inasmuch as the investment cost is the largest factor in the cost of gas for peak loads the one shell process for at least the excess capacity at extreme peak might prove to be the most economical.

In those localities where good coal and coke may be purchased at reasonable cost or where coke or even carbon briquets from oil gas manufacture are produced in excess of the demand, carburetted water gas would prove out to advantage. Even in localities not generally considered as being within the reach of cheap fuel oil the ready market for coke might make oil gas the most economical up to a certain percentage of the peak demand.

In connection with the remainder of gas works equipment used during peak loads the kind of apparatus for water and oil gas is about the same, with the exception of filtration and by-product equipment in connection with lampblack. Knowing that a percentage of the machinery will be used for standby only during peaks, the equipment might be purchased with this in view. This equipment would be used for such periods and also for emergency units only during normal operation. Such equipment, while it should be of ample size and strength, need not have the ruggedness and efficiency of apparatus expected to function continuously for 24 hours a day and 365 days per year. When we consider that extreme peaks occur but once in a number of years the importance of this must be realized. To take a specific example, records of the U. S. weather bureau for Portland, Oregon, show that the most extreme weather condition of a 6° F. mean day has occurred but once during the past 57 winter seasons. 10° F. mean daily conditions has occurred on an average of but once in 10 years. 16° F. mean daily temperature has occurred on an average of but once in 4.3 years and 20° F. mean daily temperature on an average of but once in three years. The average of all mean daily temperatures of 32° F. or colder is 25° F. The duration of these extreme peaks has varied from two to 10 days. If equipment were furnished for the most extreme condition 29 per cent of it would be idle for all but an average of four days out of each year.

EXAMPLE OF EQUIPMENT FOR "PEAKS"

For an example of such equipment suppose that a gas compressor is to be used in transmitting the gas from the place of manufacture through a long main. At peak load periods the pressure required might be 75 pounds per square inch while the normal pressure might only be 25 pounds per square inch. It would hardly be economy to purchase a steam driven machine designed to give maximum economy at 75 pounds pressure where smaller cylinders and longer cut offs would take care of the load at a lesser economy. Machines designed to operate against a maximum of 75 pounds pressure for short periods only would not be of such massive construction as if they were designed for continuous 24 hour operation. The steam demand of such equipment would, of course, have to be balanced against the boiler plant capacity.

By the use of electric equipment, with power purchased from the outside, a large saving may be made in initial investment, because the cost of electric equipment, including transformers, starters and wiring will be less than that of the boiler capacity and the steam units necessary. Also, even in some plants where it may be necessary to in-

*1297 report of the Pacific Coast Gas Association committee on Peak Loads, presented at the Santa Cruz convention of the P. C. G. A. The committee was made up of: R. R. Ripley, Portland Gas and Coke Company, Chairman; Van E. Britton, Pacific Gas and Electric Company; C. M. Cole, Southern California Gas Company; George Wehrle, Public Service Company of Colorado.

**P. C. G. A. Proceedings, Vol. 17, P. 381.

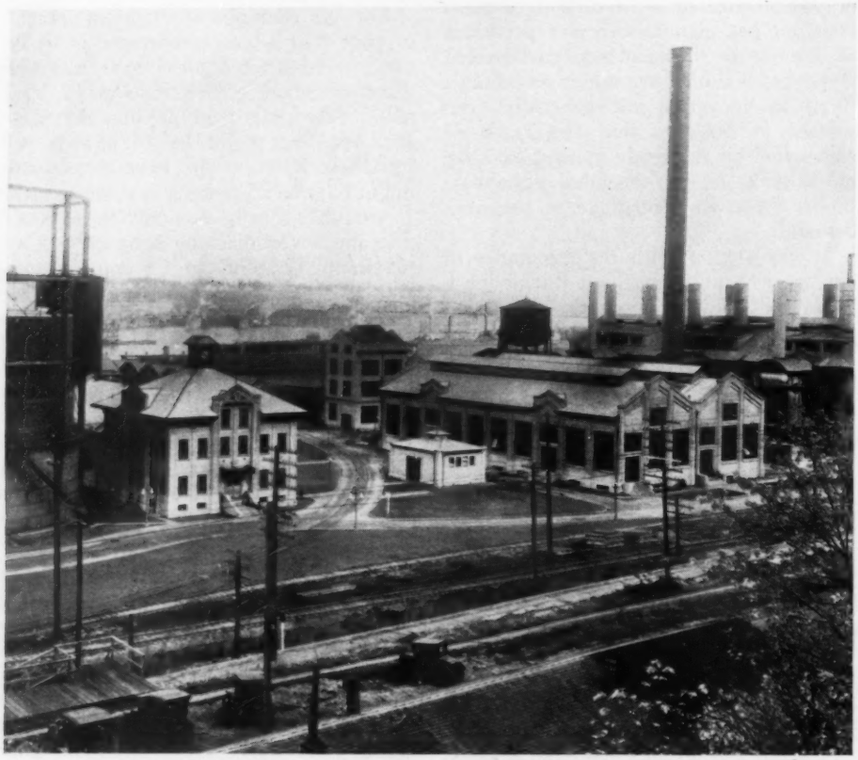
stall electric generators, the saving in steam usage may be such that the total proportionate cost of steam boiler, electric generator switchboard and motors will be less than that of the proportionate steam boiler and steam engine cost.

Where centrifugal exhausters are used they may be installed so as not to become obsolete with increased pressure requirements at peak by being connected for either series or parallel operation. Although with series operation the capacty of two exhausters at peak would be less than their capacity in parallel at at lower required pressure, the entire capacity of a machine designed to operate at lower than the required percentage at peak would not be lost.

When the system of works piping, connections, scrubbers, purifiers, etc., gets to a point where the pressure necessary to push the required amount of gas at peak exceeds that for which the exhausters were designed it may be feasible to install a large booster exhauster in place of larger or parallel mains. Such exhausters could perhaps best be driven by steam engines, steam turbine or variable speed motors. They might be placed in the system directly after the relief holder and be of ample capacity to furnish greater gas volume than the already installed exhauster capacity. Here is a specific example of equipment that might be used for peak periods only. Such centrifugal exhausters would be designed to boost the pressure enough to overcome pressure drops through mains, washers, purifiers, etc., occasioned by the peak demand. Depending upon conditions this pressure might be small, 10-inch or so. Power requirement of motor or engine would be small. The construction of the machine could be relatively light. The operating cost of such equipment plus investment charges would in most cases be less than the investment charges less any saving that would be made by the average lower pressure due to increased pipe capacity. The maximum limit of pressure would be determined by the design of apparatus in the system.

Transmission mains with the cheaper type of steel instead of cast iron pipe, where soil or other conditions do not prevent its usage, will hold down peak investment to a minimum and with proper construction prevent excess leakage which might outweigh the investment saving. Such mains designed for high pressure together with compression plants for high pressure up to the maximum economic limit of at least one stage compression are generally conceded as giving the least total costs.

For given localities intermediate pressure feeders or a belt system feeding into low pressure mains through district governors would cheapen the peak load investment over a strictly low pressure system. Such a system, if connected through intermediate pressure boosters, to the district storage holders makes a very flexible arrangement and has been in use for some time in the larger cities.



Plant of Portland Gas & Coke Company

The use of high pressure mains feeding the more sparsely settled districts with high pressure storage holders at locations of load concentration particularly at the greater distances from the manufacturing or holder supply stations is coming into use as a means of cheapening the investment to tide over peak load periods.

In the natural gas districts this system of high pressure storage has been worked out to excellent advantage. This is well set forth in an article by A. F. Bridge published in Proceedings Pacific Coast Gas Association for 1926.

INCREASING EQUIPMENT CAPACITY

With existing systems and apparatus a study of methods for increasing the capacity for peak load conditions may save considerable investment charges. Among such methods is to be considered the use of more oil in carburetted water gas sets. One company reports a considerable increase in capacity and a richer gas at a sacrifice of efficiency. The use of oil in the superheater with oil gas production to parallel water gas in the generator and carburetor is also proposed to gain capacity over short periods.

The use of lighter gravity oils at a higher cost per barrel in both oil and water gas sets is also a possible means of greater set capacity. Tests made on 20-foot straight shot generators of the Portland Gas & Coke Company for a period of three and one-half days showed that Diesel oil of 26°Be gravity compared to fuel oil of 17°Be gravity increased the set capacity from 2,500,000 to 3,100,000 per 24 hours, or 24 per cent, without carbon trouble. In fact indications were that the machines were in better condition at the end of the three and one-half day period than at the start, fuel oil having been used in the machine prior to the test. The use of a still higher gravity oil, gas oil of 32°-34°Be for example, might have shown a still greater capacity. The price of the oil is hardly to be considered as yet since this test showed that Diesel oil at $6.02 per bbl. might be used in competition with fuel oil at $1.30 per bbl. during a peak load period of one week, because of the added saving in equipment, with investment cost at 15 per cent. The only added equipment would be a tank for the storage of another grade of oil during the peak period.

Boiler capacity may be increased by the substitution of mechanical for steam atomization with the proper furnace and floor construction. Continuous loads of 200 to 250 per cent rating and more for short duration are commonly carried. The added expense of furnace repairs at the necessary higher temperature is

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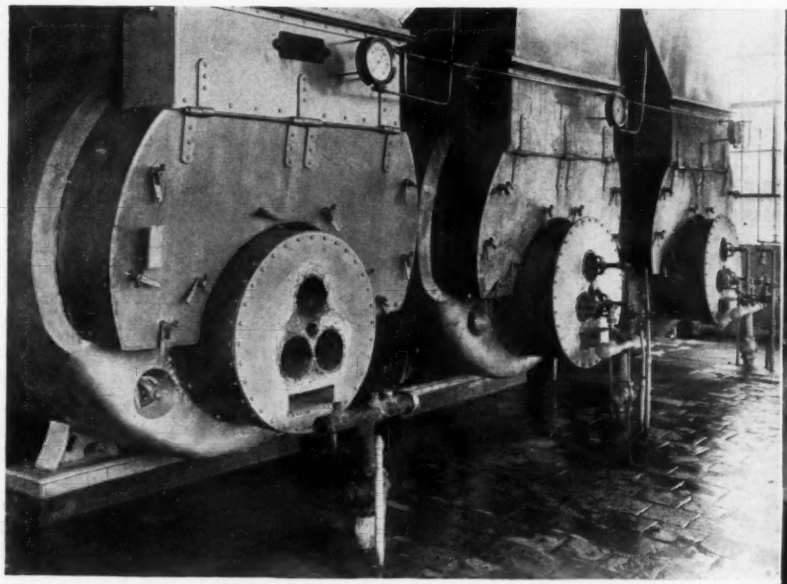

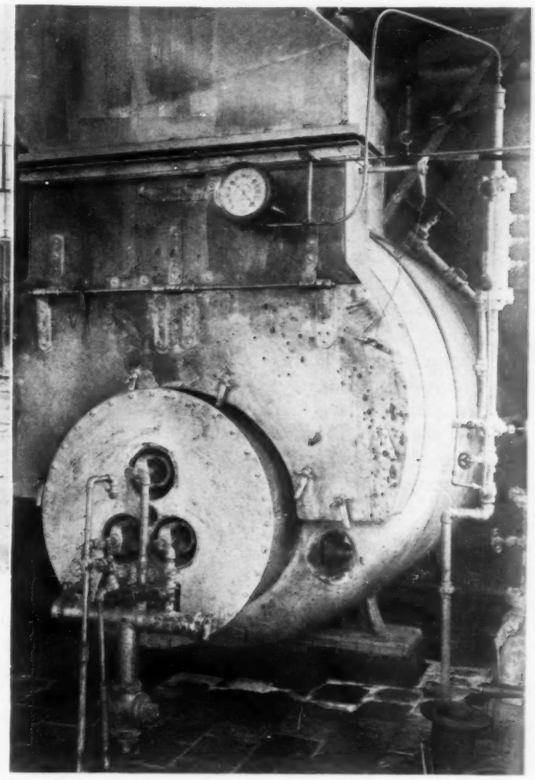

Illustration at left: Three 100 H. P. boilers equipped with high pressure burners and automatic pressure regulator. Above: Front view of boiler in same installation.

Gas *for* Tight Boilers

By GEORGE BOWERSOX

Southern California Gas Co.

THERE is seldom any connection between the trade name and the equipment it designates, but the Scotch Marine boiler is the outstanding exception. This becomes more apparent after reviewing some of the well known advantages of this type of boiler:

George Bowersox

1. Old golf balls used for hand hole plates. 2. Minimum radiation loss. 3. Require no setting. 4. No leakage of excess air into the furnace, as may occur in brick settings. 5. Good steamers—quick steamers. 6. Require little overhead room. 7. Large steaming capacity for the space occupied.

Due to these advantages this type of boiler is well adapted to the requirements of small laundries, dairies, etc. The main disadvantage is the limited combustion space which, after all, limits the capacity of a boiler. Because of this it is necessary to carefully calculate the load the boiler is to carry on account of this limiting factor.

The question of which gas burner should be used in a Scotch Marine boiler has usually been decided by the gas burner salesman. Due to the comparative short travel of the products of combustion, it is essential to have a burner which produces a short flame.

It is a known fact that flame is a phenomenon of oxidation; therefore a long-flame-producing burner allows less time for the products of combustion to be in contact with the heat absorbing areas. Assuming that the burner will produce a short flame still leaves the problem unsolved, because there are high pressure burners requiring about two pounds gas pressure for good combustion and low pressure burners that need only a few ounces gas pressure for economic operation.

The cost of the gas burner, the available gas pressure and the installation of the auxiliary oil burner in its proper place are features that must be considered in a gas installation.

The size of a low pressure burner will solve the problem of where the burner should be placed, because such burners are large and it is usually the case that the low pressure burner covers all the available space in the end of the fire drum and must be set horizontal. The brick work in the internal drum is the same in Scotch boilers regardless of whether a low pressure or a high pressure burner is installed.

High pressure burners are usually designed to incorporate the Venturi tube principle. The arrangement of the high pressure burners requires more thought to obtain the desired results. These burners should carry from 30 to 50 boiler horsepower

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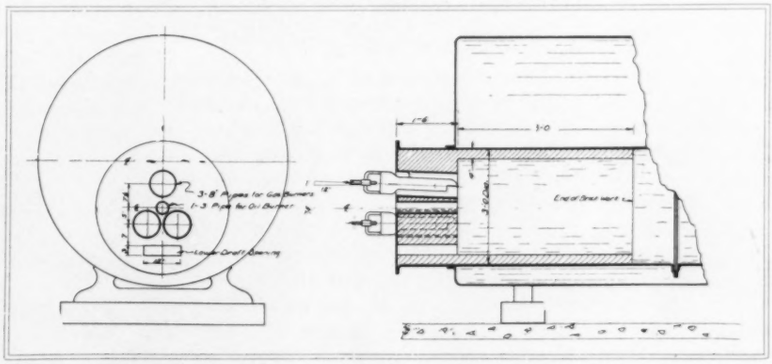

Burner installation for a Scotch Marine Boiler. Left: Front elevation. Right: Cross section.

Factors *in the* Design *of* Heat Transmission Equipment *in* Natural Gasoline Plants

By W. K. LEWIS

CONSIDERABLE laboratory research on problems underlying design of natural gasoline recovery equipment has been conducted by the Department of Chemical Engineering of the Massachusetts Institute of Technology. At the St. Louis sessions of the American Institute of Chemical Engineers, held December 5-8, two contributions to the program were made by W. K. Lewis, representing the M. I. T. chemical department. One of these, a paper entitled "Oil Absorption of Natural Gasoline," appeared in "Western Gas" for December. The other is published on this page.—Editor.

HEAT transmission equipment represents an important item of expense in natural gasoline plants. Designing engineers have frequently found it difficult to correlate test data with results predicted on the basis of formulas which are known to be dependable under other conditions. In consequence, design has had to be based largely on empirical rules, applicable only under limited conditions. This is particularly unfortunate wherever the designer is anxious to get the best possible correlation of plant elements from the point of view of economic balance. During the last few months certain factors have been brought to light in other fields which undoubtedly play an important part in natural gasoline technique. It is the purpose of this paper to call attention to these factors, in the hope that an appreciation of them may help engineers in this industry in the interpretation and utilization of the data avaliable.

One of the important heat transmission problems of the natural gasoline plant is the cooling of gases so rich in high boiling constituents that condensation occurs during the cooling process. In the past it has generally been assumed that this cooling takes place in two stages—the removal of the superheat, followed by further cooling accompanied by condensation. The first stage involved in general a relatively high temperature difference but a low coefficient of heat transmission, whereas in the second stage the available temperature difference was low but the coefficient high. Furthermore the total amount of heat removed in the first stage was small and in the second, large. Under special conditions all this may be true, but very frequently it is not, as an analysis of the underlying factors ought to have shown us long ago.

Consider the case of a highly superheated mixture of gas and condensable vapor traveling through a condenser tube, the outside of which is cooled with cold water. Under any normal conditions the thermal resistance between the water and the exterior surface of the tube is low and that of the tube itself even lower. Consequently the inner surface of the tube will be at a temperature very little above that of the cooling water. Now, on this inner wall of the tube there is a relatively stationary film of gas which insulates the wall itself from the main body of the gas. Through this film there is a temperature gradient, and the temperature of the gas in actual contact with the metal wall is that of the wall itself. Obviously, this wall temperature may very well be below the temperature of condensation of the gas, despite the fact that the main body of gas traveling through the pipe is far above its dew point. In such case, condensation will occur on the metal wall. This will coat the wall with a liquid film will exist whenever conditions are further to insulate the gas from the cooling water. However, under many conditions, the resistance of this liquid film is low in comparison with that of the gas film, but whether this be true or not, condensation will occur and the liquid film will exist whenever conditions are such that the temperature of the inner surface of the pipe wall is below the dew point of the gas. In other words, condensation of a gas can start long before the gas as a whole has been cooled down to its dew point.

That this sort of thing occurs has recently been demonstrated experimentally by a number of investigations. Thus, in the determination in this laboratory of the coefficient of heat transmission between a mixture of air and steam and the metal wall of a pipe past which the mixture was flowing, the mixture had an original dew point of 180 degrees F., the temperature of the mixture even after cooling being, however, 40 degrees higher than this, namely 220 degrees. The cooling water temperature was at no point over 120 degrees. However, there was realized a transmission coefficient over ten fold what one would anticipate in view of the pipe diameter and gas velocity. Furthermore, water was condensed in the pipe and a stream of liquid flowed from it.

Theoretical analysis of the problem shows that, in such case, if one plot the saturation curve with temperature as abscissae and humidity expressed as pounds of vapor per pound of dry condensable gas as ordinates, the path followed by the cooling and condensing gas-vapor mixture should be a straight line, provided conditions are such that the surface temperature of the liquid film on the pipe existing between the pipe and the gas be constant. It follows from this that the heat absorbed by the cooling medium from the gas per degree of temperature drop of the gas mixture as a whole is nearly, though not quite, constant throughout the range. In other words, conditions are not at all those ordinarily assumed. In the first place, condensation takes place from the start and not merely at the end of the process. Furthermore, the heat lost by the gas in the early stages of cooling is as great as that lost later. Finally, the gas as a whole never becomes saturated until condensation is substantially complete, although during the later stages of cooling it very closely approaches the saturated condition.

While it is plain that these conditions are never perfectly realized in the recovery plant, they are by no means hypothetical assumptions of no interest to the natural gasoline engineer. Thus, in the water-sprayed pipe coolers used in so many plants, the water on the exterior surface of the pipe is cooled to such a degree by atmospheric evaporation that these conditions are at least approximate. It is true that during the early stages of cooling, while the gas is still hot, the water is relatively hot also. However, this is a point at which the temperature difference is large and if the cooling water temperature be assumed constant at a value equal to that at the cold end of the cooler, the error in determining the overall temperature difference is not serious. Furthermore, even allowing for the higher temperature of the water at the hot end, pipe wall temperature at that point is likely to be below the dew point of the gas and condensation therefore starts in at a very early stage of cooling. It can

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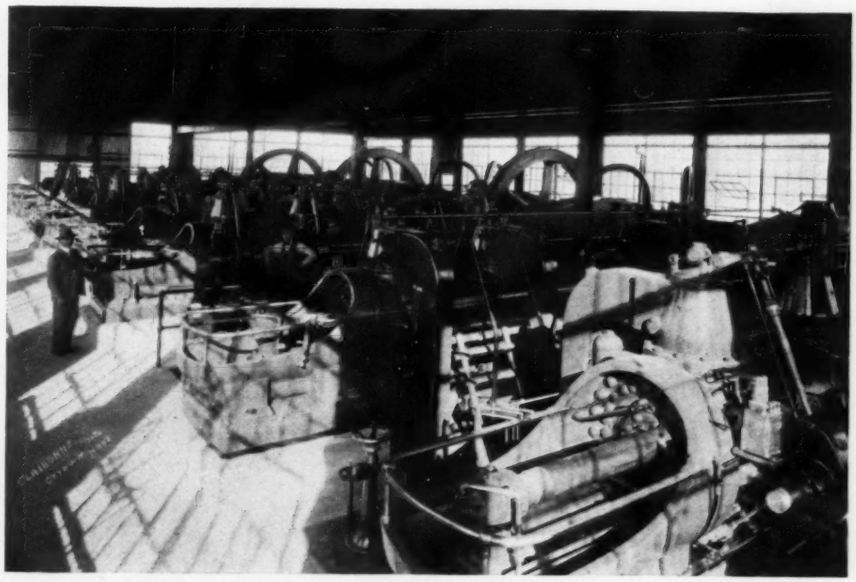


The illustration shows the interior of the Ottawa, Kan., compressor station on the Empire line—one of four stations operating on the 250-mile carrier, with a total of 13,000 B. H. P.

Four 1000 B. H. P. Cooper units are contained in the Ottawa plant. The compressor equipment for the Empire line formed the largest single order ever placed for such apparatus.

Giant Empire Gas Line Goes *on* Duty

By KEITH CLEVENGER
The Empire Companies

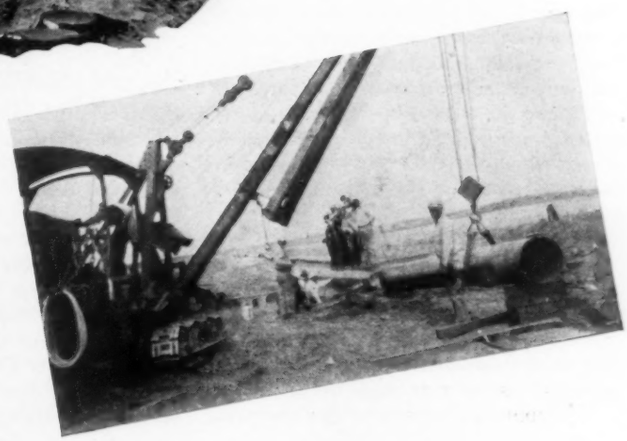
ONE hundred and thirty-five cities, towns and communities of Oklahoma, Kansas and Missouri are reaping in an increased gas supply the benefits of the 20-inch pipeline recently completed for the Cities Service Gas Company, subsidiary of the Empire Gas and Fuel Company. On December 30, 1927, the $15,000,000 line was formally put into service. The contract for the line's construction from a point near Pampa, Texas, in the gas area of the Panhandle, to Ottawa, Kansas, a distance of approximately 250 miles, was let last May. Inasmuch as this major line represents the most important development in gas transmission to be carried to completion last year it will perhaps be of interest to briefly review some of the principal features of the project.

The first problem facing the company was to determine whether gas reserves sufficient in volume and rock pressure could be developed to assure an adequate supply over a period of years, sufficient to justify the construction of such a line. It was necessary to ascertain what possible markets could be developed, their nature; and the probable demands they would make upon the new system; what balance as between domestic and industrial load would have to be developed to establish a desirable load factor, as well as the revenues to be obtained in order to render the company the necessary return upon the immense increase in property value made necessary by the construction of such a project.

These questions satisfactorily disposed of, the pipeline route was planned and the right-of-way secured. Preparing *(Continued on Page 49)*

BELOW: Multiple lines at major river crossings guard against interruption of service. A 20-inch manifold is used with the 20-inch lines.

LEFT: A section of the Empire line laid across a river bed. Note the heavy steel river clamps used. BELOW: Handling the pipe.



Not a hangover from the days of the Dons, but a modern gas office, at Santa Barbara, Calif.

The Gas Office Keeps Step

IN A COMMUNITY RENAISSANCE

ORDINARILY the opening of a district office is only cause for small talk in the gas industry. Companies serving numerous communities are constantly improving their facilities in each. The investment put into district headquarters is usually comparatively limited, and in the building project there is seldom anything to be considered save efficient planning for serving the district's gas needs.

But in the construction of its Santa Barbara, Calif., district office, which was opened last month to the public, the Southern Counties Gas Company has done a piece of work which could well serve as a pattern—at least in its purpose and thoroughness of treatment—and which on two counts is entitled to general notice. First, through it the gas company has "localized" itself in Santa Barbara to the *nth* degree. Second, the central feature of the new office is a room given over to home service demonstration, which will later be described in some detail. A floor plan of the demonstration platform will be found on another page of this issue.

To appreciate what the gas company has done in its new Santa Barbara office it is almost necessary to know something of this lovely, sea-girt, old-world community of Santa Barbara—known far and wide as a tourist center, remarkable for its historic old Mission, and more recently accorded general attention by reason of the calamitous earthquake which in June, 1925, reduced the city's business structures to literal ruins.

MODEL KITCHEN FEATURES UNIQUE DISTRICT OFFICE IN SANTA BARBARA

SINCE this fateful quake the city has turned its united effort and its best minds to the task of rebuilding, and it did not enter the task blindly. Spanish tradition has always clung close to Santa Barbara, and now in the city's rebuilding, under the stimulus of the Community Arts Association, the Spanish motif has been made to dominate the architecture of the entire community. Seventy-five per cent of the buildings in the city would class as Spanish. On every side in the business center of the town are to be seen the characteristic touches—the covered archways, the patios, the wrought-iron grille work, the outside stairways and galleries on upper stories, the 'dobe finishes on building exteriors, and the warm tile roofs.

Two years and a half have been given to this inspired rebuilding, well-called a Renaissance, and the city has turned a catastrophe into a positive asset. In such surroundings, with such united community sentiment existing on the subject of architecture, it would have been a tragedy in lost opportunities had the gas company failed to "keep in step" when it erected its steel-frame quake-proof structure.

Contrary to its usual custom the company employed a local architect, working hand in hand with the community arts group, and four sets of plans were called for until the looked-for effect was achieved. The gas company was on its mettle to make a definite contribution to Spanish Santa Barbara, and a few examples will show the ends to which the company went to see that its edifice was one hundred per cent in

keeping with its community.

A subdued tinge of orange has been added to the exterior stucco, and the roofing of the building is of Mexican hand-made tile; incidentally, tile burned in gas-fired kilns. Four arches front the loggia across the building's face, the arcade extending entirely over the sidewalk.

ALONG this front arcade, centered on each of the four arches, are set four Spanish lanterns into which have been fitted three-mantle gas arcs. These lanterns are exact reproductions, enlarged, of a model secured from Mexico, and were made by a local iron works. A balcony, faced with ironwork, is on the north side of the building, and from the model kitchen demonstration room on the same side an exterior stairway leads down. Large display windows on the lower floor are arched, as are also the two doors.

Several phases of the interior treatment should be mentioned, among them the flooring, which for the first story is of 12-inch by 12-inch hand-made red Spanish tile, gas burned in continuous kilns. Concrete beams of this lobby ceiling were formed with the rough side of the lumber moulds "turned in," so as to secure an exact simulation of timber grain, the concrete being stained to an old-timber hue. Plaster throughout is of adobe finish, similar in color to the building exterior. Customers' service counters are of mahogany, mouldings and carvings being in Spanish diamond pattern. Stucco arches are over the counters—Spanish again. On the south wall is a large fireplace, with typical Spanish receding hood, tapering on the sides, the fireplace being designed for demonstration of high quality radiant type heaters.

Above the fireplace is set a vestal urn, designed by the Santa Barbara Community Arts Association, with a plaque behind it showing three virgins in low relief, and below the urn in incised lettering is the following inscription:

"Twenty centuries ago the temple of the goddess Vesta, with its sacred fire kept ever burning on her altar, watched over by six virgins, symbolized the sanctity of Roman hearth and home. Today, as then, your hearth and home has its never-failing fire, guarded by faithful servants, and symbolizing comforts unconceived in ancient Rome."

A gas flame, always alight to symbolize the continuity of gas service, flares in the urn, and the mayor of the city put the match to the flame on the building's official opening.

Back of the fireplace runs a covered stairway, with one balcony landing overlooking the lobby, leading to the demonstration room above. From the balcony landing may be had a birds-eye view of the appliance display maintained on the lobby floor. A full line of domestic appliances, including gas refrigerators, is on display here, and it is noteworthy that colored ranges had their first Pacific Coast showing in this lobby, during the opening ceremonies.

And now to turn briefly to the feature through which the district office makes a contribution to home service technique—the model kitchen and demonstration room. In the designing of this unit the company's home service staff was called into consultation, and housewives on the company's lines also were freely asked for suggestions, so that the arrangement of modern kitchen facilities would represent the highest degree of convenience and beauty.

At one end of the auditorium, which seats 200 or more, is the demonstration platform, made to give the effect of the working end of a modern kitchen. The raised platform is only a foot and one-half above the floor level, bringing the teacher close to the class. Those "in the know" say that this is an important psychological factor in effective demonstration; for the convenience of the demonstrators two hinged steps have been added so that access to the audience will be easy, and the steps may be removed when the platform is to be used for other purposes such as employee activities, company sales meetings, and the like.

Several innovations are to be found in the Southern Counties model kitchen, and each has been introduced as an aid to convenience. Thus it will be noticed that the range has been placed along side of the kitchen sink, which reverses the custom of years in usual kitchen design. The theory is—and it sounds logical—that the housewife works chiefly at these two points. the range and the sink, which hence should be together to save her steps. If space is not available along the same wall, it is contended that the gas range should be along one of the adjoining walls instead of across the room, so that the housewife's eye may be upon the food under preparation while she is at the sink.

ANOTHER labor-saving feature is the elimination of all cracks, corners and crevices which catch dust and are difficult to clean. Everything in the Southern Counties kitchen fits flush. The legs have been removed from the stove, and a cupboard for storing of kitchen utensils has been fitted under the range. The panels on this cupboard, and the drawers and cupboards under the sink are all built flush. Even the kitchen door carries out this thought, being perfectly smooth, and the baseboard has been made flush with the plaster. Gas water heater and gas refrigerator have both been built in flush with the front wall, and the tile around the sink has been made flush with the plastered wall.

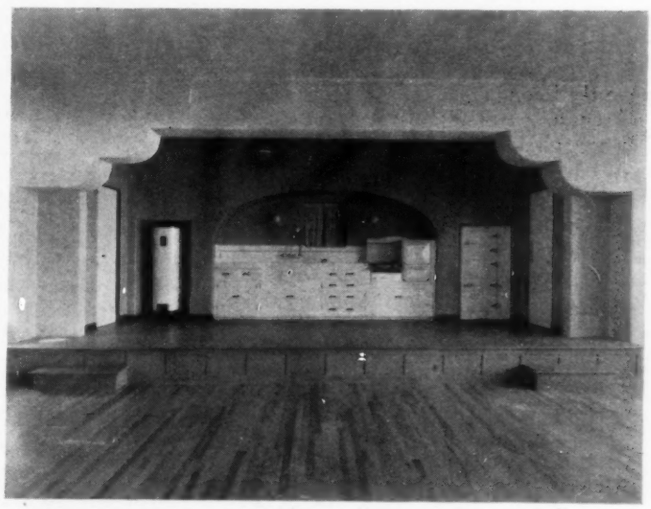
The water heater at the left of the sink can be removed and a kitchen cabinet inserted in its place, the cabinet also fitting flush with the wall.

With an eye to beauty and cheerfulness in the kitchen a note of color has been added, cadmium yellow being the

(Continued on Page 48)

RIGHT: Model kitchen in new Santa Barbara office, showing water heater, cupboard, sink, range, and gas refrigerator.

BELOW: Vestal urn and plaque which add a note of beauty above fireplace in lobby. Gas flame in urn burns constantly to symbolize continuity of gas service.



PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Executive Secretary

Program *for* Southern Regional Conference

Place, Los Angeles, Calif.—*Dates,* February 23, 24, and 25, 1928

AS the program below reveals, a large place in the Southern Regional Conference has been given to the Pacific Coast Sales Conference, which is being jointly sponsored by the American Gas Association and the Pacific Coast Gas Association. In this sales conference sales executives and salesmen of Coast companies are provided an opportunity which they cannot afford to miss. A sales consciousness is daily becoming more pronounced in the gas industry, and this new tempo will have forceful expression at the February meeting.

Other sides of the regional conference have been adequately cared for. There will be sectional meetings as usual, to allow for further whipping into shape the numerous committee projects. One general session, and a dinner dance, complete the line-up.

Program particulars as announced below are subject to some change and addition, but in the main will hold as given.

THURSDAY, FEBRUARY 23, 9:00 A. M.

Simultaneous Meetings of Accounting, Public Relations, and Technical Section, Los Angeles Gas and Electric Corporation Building

810 South Flower Street

Accounting Section—Room 1026.

9:00 a. m.—Reports of Committees and discussion of Accounting Problems.

Public Relations Section—Room 926.

9:00 a. m.—Papers, Reports and Discussion.

Technical Section—Assembly Hall, 12th floor.

9:00 a. m.—Reports of Committees and Symposium on Operation.

THURSDAY AFTERNOON

Assembly Hall, 12th floor, Los Angeles Gas and Electric Corporation Building, 810 South Flower Street

2:00 p. m.

"Improved Methods Make Men Dear and Their Product Cheap."

C. A. Gummere, Industrial Business and Service Organization.

"Public Relations from the Consumers' Viewpoint."

Dr. W. D. Moriarty, Professor of Economics, University of Southern California.

"The Effect of Inferior Appliances on the Gas Load."

A. R. Bailey and W. F. Brandt, Los Angeles Gas and Electric Corporation.

"Modern Merchandising Methods for Gas Companies."

Graham Hughes, Advertising Counsel.

THURSDAY EVENING, 6:30 P. M.

Informal Dinner Dance

Los Angeles Chamber of Commerce

12th and Broadway—8th Floor

Music and Entertainment

$2.00 per plate

FRIDAY, FEBRUARY 24

PACIFIC COAST SALES CONFERENCE

(Sponsored Jointly by the American Gas Association and the Pacific Coast Gas Association)

Assembly Hall, Los Angeles Gas and Electric Corporation Building, 810 South Flower Street

9:30 a. m.

SYMPOSIUM ON THE INDUSTRIAL AND COMMERCIAL LOAD

"The Industrial Potential."

C. M.Grow, Southern California Gas Company.

Discussion.

"Selling Hotels and Restaurants."

F. U. Naylor, Pacific Gas and Electric Company.

Discussion.

"Compensation of Salesmen for Rapid Load Building."

H. C. McAllister, Southern California Gas Company.

Discussion.

FRIDAY AFTERNOON 2:00 P. M.

SYMPOSIUM ON THE DOMESTIC LOAD

"What the Blue Star Means."

K. H. Flint, American Gas Association Laboratory representative.

"Capitalizing the Blue Star."

J. W. West, Jr., Secretary Commercial Section, Amercan Gas Association.

"Merchandsing with a Punch."

J. E. Davies, General Manager, Peoples Gas Stores, Chicago.

"Color in the Kitchen."

Isobel Allobach, Home Service Director, Southern Counties Gas Company.

"Successful Campaigns."

Forceful Talks on sales campaigns that produced results.

"Planning the Campaign."

C. H. Potter, Commercial Manager, Southern Counties Gas Company.

"The Manufacturer's Responsbility."

Frank Packer, Welsbach Company.

"Selling Refrigeration."

J. C. Douglas, National Refrigerating Company.

FRIDAY EVENING 7:30 P. M.

SYMPOSIUM ON COMPETITION

"What Can We Learn from Our Competitors?"

Frank Weiss, Los Angeles Gas and Electric Corporation.

"Meeting Electric Competition."

Geo. W. Smith, Southern Counties Gas Company.

"Meeting Oil Competiton."

Chas. Robert, Los Angeles Gas and Electric Corporation.

"The Little We Have Done and What We Would Like to Do."

A. F. Morairty, General Sales Manager, Central Arizona Light and Power Company.

A buffet supper of sandwiches and coffee will be served at the close of this meeting.

SATURDAY, FEBRUARY 25 9:00 A. M.

INDUSTRIAL INSPECTION TRIP

Through the courtesy of the local gas companies an inspection trip will be arranged for those who wish to see a number of the outstanding applications of gas fuel to industry in the Los Angeles District.

ASSOCIATION CALENDAR

SOUTHERN REGIONAL CONFERENCE
Los Angeles
February 23-25, 1928

JOINT MEETING WITH ARIZONA UTILITIES ASSOCIATION
Prescott, Arizona
April 26 and 27, 1928

NORTHERN REGIONAL CONFERENCE
Vancouver, B. C.
June 6 and 7, 1928

35TH ANNUAL CONVENTION
Hotel Coronado, Coronado, Calif.
September 17-20, 1928

Additional Committee Appointments

ANNOUNCEMENT was made on the Association pages in *Western* Gas for January, of the 1928 committee set-up. Additions to various of the committees have been made, and information is available on several committees not included last month.

ACCOUNTING SECTION

Ratios and Graphs

C. E. Neiderer, Chairman, Portland Gas and Coke Company.
B. A. Conklin, Coast Counties Gas anud Electric Company.
R. C. Davis, Southern California Gas Company.
W. A. Worthington, Pacific Gas and Electric Company.

COMMERCIAL SECTION

Heat Conservation

Leo Kroner, Chairman, Portland Gas and Coke Company.
H. D. Sherrill and B. S. Shera, both of the Tacoma Gas and Fuel Company, will serve on this committee in place of H. E. Seagraves.

TECHNICAL SECTION

Chemical Laboratory Methods

Duncan Stewart, Chairman, Pacific Gas and Electric Company.
Mr. Stewart has added M. A. Richford, Pacific Gas and Electric Company, Oakland, to this committee.

Customers' Service

A. R. Bailey, Chairman, Los Angeles Gas & Electric Corporation.
Mr. Bailey has added D. H. Perkins, of the San Diego Consolidated Gas and Electric ompany, to this committee.

Domestic Gas Meter and Regulator Installation and Operation

D. H. Perkins, Chairman, San Diego Consolidated Gas and Electric Company.
Mr. Perkins has added the following men to his committee:
R. M. Stewart, Pacific Gas and Electric Company.
F. H. Coble, Southern California Gas Company.
A. E. Finley, Portland Gas and Coke Company.

Internal Pipe Corrosion, Dust Control and Dehydration of Gas

H. M. Barnes, Chairman, San Diego Consolidated Gas and Electric Company.
Mr. Barnes announces his committee as follows:
R. M. Ranyard, Southern Counties Gas Company.
N. H. Wardale, Portland Gas and Coke Company.
J. T. Sullivan, Truckee River Power Company.
J. E. C. Currens, Western States Gas and Electric Company.
M. T. Burton, Southern California Gas Company.
D. E. Widdersheim, Western States Gas and Electric Company.

Mechanical Equipment for Field Construction Work

R. V. Wilson, Chairman, Pacific Gas and Electric Company.
Mr. Wilson has placed D. B. Larson, Portland Gas and Coke Company, and C. D. Bell, Southern California Gas Company, on his committee.

Oil Gas Generator Operation and Refractories

R. R. Ripley, Chairman, Portland Gas and Coke Company.
Mr. Ripley announces his committee as follows:
C. M. Cole, Southern California Gas Company.
W. C. Hornberger, Central Arizona Light & Power Company.
J. A. Harritt, San Diego Consolidated Gas and Electric Company.
J. E. Kelley, Pacific Gas and Electric Company.
T. N. Kellett, Los Angeles Gas and Electric Corporation.
J. W. Moncrieff, Stockton Firebrick Company.
Frank Wills, Pacific Gas and Electric Company.

Safety Education and Methods

J. R. Rowe, Chairman, Los Angeles Gas and Electric Corporation.
Mr. Rowe announces the following committee:
S. C. Dickinson, Pacific Gas and Electric Company.
R. R. Blackburn, Southern California Gas Company.
W. P. Dawe, Southern California Gas Company.
G. I. Drennan, Pacific Power and Light Company.
J. J. Ferrari, Puget Sound Power and Light Company.
Fred Olsen, Mountain States Power Company.
W. E. Richmond, San Diego Consolidated Gas and Electric Company.
Roy T. Richards, Central Arizona Light and Power Company.
R. M. Ranyard, Southern Counties Gas Company.

Coast Growth Is Above National Average

(Continued from Page 19)

14,000 gas ranges were sold by gas companies during 1927 and also 5000 tank water heaters, 3200 automatic water heaters, 6000 space heaters, 1000 furnaces, 200 gas fired boilers, and some 1500 industrial appliances. There is unfortunately no record of dealer sales.

Greatly increased activity in appliance merchandising can be expected in 1928, as the domestic sales including house heating represents about 56 per cent of the total load.

$15,000,000 FOR BETTERMENTS

Notwithstanding the fact that no large projects are under way, gas companies will spend about $15,000,000 in 1928 in general betterments for the improvement or extension of service. Among these improvements are the following:

Central Arizona Light and Power Company:
A 14-foot oil gas generator complete with purifiers etc.

Tucson Gas Electric Light and Power Company:
A gas dehydration system.

Los Angeles Gas and Electric Corporation:
One hundred miles of main extensions with services, meters and regulators to take care of 18,000 new customers.

Modesto Gas Company:
New Oil gas generator complete with washer and scrubbers; extension of 6-inch and 8-inch feeder mains.

Pacific Gas and Electric Company:
Eleven miles of 16-inch high pressure line, San Francisco to San Bruno.
Transmission line, Marysville to Chico.
Water gas unit at Vallejo Works.
Numerous extensions to serve new territory.

San Joaquin Light and Power Corporation:
One mile of 8-inch, three of 6-inch and three of 4-inch main in Bakersfield.

Southern Counties Gas Company:
New offices in El Monte, Arcadia and Pomona and a warehouse at San Pedro. High pressure holders at San Pedro, Monrovia, Anaheim and Pomona.

Pacific Power & Light Company:
A new compressor at Pendleton, Oregon, and replacement of 4-inch main at Lewiston.

Western States Gas & Electric Company:
Improvement of Stockton plant, boilers, etc.
Rebuilding of large gas holder.

TABLE NO. 2
VITAL STATISTICS OF GAS COMPANIES
IN THE FOUR MAJOR PACIFIC COAST DISTRICTS

	MCF Sales	Meters	Miles Main	Gross Revenue	Sales MCF per meter
Arizona—3 companies out of 6					
1926	405,362	13,351	245	696,387	30.4
1927	472,883	14,936	268	790,981	31.6
Change	+17%	+8%	+23 miles	+13.5%	+4%
California and Nevada—manufactured Gas—9 companies out of 12					
1926	20,498,846	507,120	5,788	21,243,967	40.4
1927	22,765,791	522,901	6,016	23,551,144	43.5
Change	+11%	+3%	+228 miles	+10.5%	+7.7%
California—Natural and Mixed Gas—4 companies out of 7					
Note: 850 B.t.u. mixed gas in 1926 and 1100 B.t.u. natural gas for 11 months in 1927.					
1926	70,616,291	619,465	8,446	29,793,621	114.1
1927	67,937,376	672,226	9,013	35,090,134	101.1
Change	−38%	+8.5%	+567 miles	+18%	−11.4%
British Columbia, Washington and Oregon—11 companies out of 13					
1926	7,417,465	236,388	3,557	9,355,628	31.3
1927	8,007,188	239,337	3,669	9,333,476	33.5
Change	+8%	+1%	+112 miles	———	+7%
Pacific Coast—27 companies out of 38					
1926	98,937,964	1,376,324	18,036	61,089,603	71.8
1927	99,183,238	1,449,400	18,966	68,765,735	68.5
Change	———	+5%	+930 miles	+12.5%	−4.6%

EDITORIAL

The Trend Is Consistently Upward

CONSISTENT growth over the past five year period is the record of the Pacific Coast gas industry, as reflected in a statistical review published in this issue under the name of the Pacific Coast Gas Association's executive secretary, Clifford Johnstone.

Using the year 1922 as a base for comparison, the P. C. G. A. survey shows twenty representative companies to have made a consistent gain, each year over the year previous, in their M. C. F. sales, number of active meters, and gross revenue. In 1927 the percentages of increase for these three classifications over 1922 were 60, 48 and 57, respectively.

With the Coast section turning more aggressively than in the past to gas appliance merchandising it does not require much optimism to prophesy that the next five years will continue the upward trend in this territory.

The most important sign of the new merchandising order is the Pacific Gas and Electric Company's adoption of a comprehensive sales program which will be felt in 351 northern California communities.

A Manufacturers Conference

AN announcement from American Gas Association headquarters indicates that definite plans are forming for linking gas manufacturers more closely to the organized industry, through widening the activity of the A. G. A. Manufacturers Section.

The chief feature of the plan as contemplated is the formation of a manufacturer's conference, to which groups making similar equipment would send delegates. Meetings are planned to be held at least four times a year, under the auspices of the Manufacturers Section. It is felt that problems facing the various gas equipment and appliance groups can be effectively analyzed through group representation in such a conference, and that the place of the manufacturers in the American Gas Association program will be greatly strengthened.

To date the A. G. A.'s best efforts have naturally been spent on problems relating directly to gas service from the utility company's angle. But the interests of companies and manufacturers are inseparable; progress made in either branch inevitably reacts to the general good. The need for synchronizing gas companies' and gas equipment manufacturers' efforts has existed from the industry's beginnings, and if the proposed conference is entered into generally by the gas equipment manufacturers it may possibly constitute a means to this end. Properly organized and administered, such a conference could be a powerful working unit to employ in solution of basic problems peculiar to the manufacturer, and it should give weight to his voice in A. G. A. councils, rounding out the scope of the national association's work for the entire industry.

Volume 18 of P. C. G. A. Proceedings

VOLUME 18 of the Pacific Coast Gas Association's Proceedings has come off the press and will shortly be in the hands of members. P. C. G. A. Proceedings date back to 1893-1897, the period covered in Volume 1, and they form a most valuable record of the industry's progress from the days of the association's formation.

The present 542-page volume records the transactions, papers and discussions of the 1927 convention held at Santa Cruz, Calif., in September, and also includes a number of papers from last year's regional meetings of the organization.

Selling the New Home

AMONG the worries which beset the commercial man are the many obstacles in the way of selling a complete gas service to the new residence. These obstacles are multiplied when the home has been built for resale, and it has been found a near-impossibility to get quality appliances into this field by ordinary methods.

As recounted on another page of this issue, the Peoples Gas Light and Coke Company of Chicago has worked out a campaign which offers the speculative builder enough to gain his attention, and which insures the home buyer the best gas service obtainable. Many home buyers who are thoroughly sold on the advantages of gas are financially unable to install complete service. But by purchasing an "all gas" home under the Chicago plan they can pay out on their gas appliances in the building contract. This is satisfactory to all concerned—to the builder because his residences have more appeal and because the gas company actively aids in their sale;—to the owner because he gets the desired gas service at terms he can handle;—and to the gas company because it sells a maximum of gas, forestalls competition, and all without tieing up its own money in the transaction.

Color Enters *the* Kitchen!

WHEREIN THE GAS RANGE CONTRIBUTES ITS BIT TO HOME HARMONY

THERE seems to be no doubt about it. Color has come to the kitchen, and the gas company is in the van among those pioneering the transition.

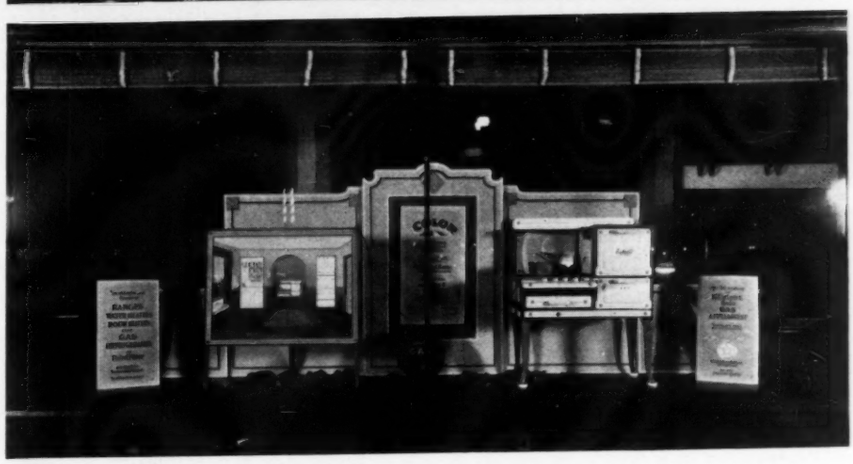
For the last five years or more the "tide of color" has been rising. Milady's raiment has reflected the trend, and no less has that of the conservative male. Now the new motif is in the kitchen, and, thanks to our gas range manufacturers, the gas utility has been enabled to step out in front of competition to grasp all the credit which attaches to being first to line up in a generally favored movement.

The philosophy which underlies the gas company's sanction of color in the kitchen is simple and direct, and runs as follows: The more attractive the kitchen, the more will the woman use it.

Years ago the old gas range which smuts up the kettle and brings headaches to the homekeeper at every mealtime became taboo. Semi-enamel and full enamel ranges, high in fuel efficiency, have long since displaced this poor relation, and gas company new business departments have wisely been pushing the quality merchandise. Now come ranges in color—full color, color trimmed, and available in a variety of colors. There have been gas ranges in gray enamel, but the new colored line makes it possible to capitalize the range as a distinct addition to the kitchen decorative scheme.

Recognizing the inevitable, manufacturers of enamel ware, linoleum, oil cloth, and a host of other kitchen lines, are now getting together on the matter of color shades. Leading enamel ware makers have standardized on four or five dominant colors in their product, and close harmony with these shades can be secured in other kitchen details at moderate cost. It is a simple matter to repaint kitchen furniture when doing over the old kitchen, and unpainted furniture may be bought and painted to order in fitting out the new kitchen.

Merchandisers of gas ranges whose first thought is for the selling profit are welcoming the colored lines—not that they make for larger profit per sale, for the mark-up is slight—but they can be sold aggressively in the new tones, and they complete the colored kitchen picture.



TOP: One of two companion windows used in January by the May Company, Los Angeles, carried out in green and featuring a Roper green-trimmed range. The other window had red as its predominating color, with red-trimmed Roper range shown. LOWER: Southern California Gas Company window, displayed in January. Estate range, trimmed in green, is exhibited.

Possibilities inherent in the new ranges are well shown in the accompanying pictures of window displays which used them as central features. The upper window, shown in January by the May Company, Los Angeles department store, was in green color scheme, a companion window being in red. Minute care was shown in both windows to harmonize every item used in their preparation. Products made by more than twenty manufacturers were contained in each of these displays, and the exact tone of green or red was preserved throughout.

In the green window—shown in picture, *everything* was green, from the linoleum and window shades to the range and the green-trimmed kitchen clock which hung over it. The floor pattern was a monotone of green, a solid green tone was carried out in kettles, oil cloth, containers for groceries and for refuse, the work table, stools and chairs. The wax figure was tastefully garbed in green, with a plain white apron for contrast. Of course the dishes had a green trim. Green dotted Swiss curtains were at the window, the tin and wicker composition bird cage was in green, and the same predominant hue characterized such miscellaneous items as the following: handles of knives, forks and kitchen cutlery, the stem of the towel rack (on which were

(Continued on Page 60)

P. G. *and* E. Outlines New Sales Plan

By H. Elliott Taylor

A NEW and comprehensive sales plan, the biggest effort in merchandising activity ever undertaken by the Pacific Gas and Electric Company, affecting 351 communities in northern California, and operating on a sales budget of approximately a million dollars, has been outlined by this utility for 1928.

Of this total, $408,000 has been apportioned to development, through co-operative and merchandising activity, and to the building up of the gas load through the sale of appliances to existing users of P. G. and E. service.

In a meeting held in the main auditorium of the company in San Francisco, R. E. Fisher, vice-president in charge of public relations and sales, touched generally on the necessity for, and the objective of, such a campaign. He was followed by H. M. Crawford, general sales manager, who discussed the project in detail for the benefit of the several hundred manufacturers, dealers and factors present.

R. E. Fisher

H. M. Crawford

OBJECTS OF SALES PROGRAM

The objects of the plan are:

1. To load existing facilities. The P. G. and E. system, covers geographically a territory of some 61,000 square miles. The capital investment is in the neighborhood of $350,000,000. Heretofore the company has looked to a large extent to its gain in new consumers to provide the necessary growth and expansion. The new plan is primarily designed to increase rather than extend the use of gas.

2. Increase favorable contact with consumers.

3. Increase the market for appliances, labor and installing materials by personal calls, advertising and bill inserts.

4. To continue the policy of dealer co-operation by arranging the sales programs of the various localities to meet the needs of these individual territories. Direct selling will be carried on in places where the dealers cannot carry the load entirely, due to a lean territory, inadequate consumer acceptance, or a lack of merchandise margin.

P. G. and E. salesmen in the field will maintain retail list prices, sell only quality merchandise, and turn over to the dealers in the several territories, prospects for other appliances. It is the hope of the company, as expressed by Mr. Crawford, that through following this plan the P. G. and E. will augment the business of the small individual dealers by creating a wider and more active market through the use of advertising and personal solicitation.

Domestic gas ranges and water heaters will be sold through dealers exclusively in San Francisco and the East Bay. But to bolster up these sales, the company plans to spend $48,000 of its sales budget on house-to-house calls, cash contributions and advertising. The estimated sales of these articles in this territory are 33,000 gas ranges and 20,000 water heaters.

On the same types of equipment in the smaller towns, 22 men will be employed, making 60,000 calls and aiming at a sales quota of $46,000 in direct sales, with a goal of $200,000 worth of sales to be turned over to the dealers.

Domestic gas water heater merchandising in San Jose, Fresno, Stockton and Sacramento will be carried on through the medium of direct selling to the old houses, with all prospects and sales promotion work on new buildings going to the dealers. Prospects for other appliances will also be turned over to the dealers. Forty-three men will be employed on this work during the spring and summer. House heating sales throughout the entire territory will be conducted by direct-selling crews as far as radiant type heaters are concerned. Fifty men will be put out on this work, with 60,000 calls confronting them and a quota of 9,000 appliances.

On major house heating, such as furnace and boiler work in competition with oil or coal as fuel, 35 men will cover the territory selling direct as well as co-operating with the dealers. A quota of 30,000 calls has been tentatively set.

Hotel and restaurant equipment will be sold through co-operation with equipment dealers on new buildings, and by direct solicitation and sale to old buildings for the replacement of coal or oil burning equipment. Nine salesmen have been allotted to this field.

Nine men will be employed on industrial gas prospects selling direct to the user.

Gas refrigeration will employ the time of two men, who will aim at a sales quota of $8,000 in installations.

The total sales cost and advertising budget for the activity in the gas appliance field thus reaches $408,000. Retail value of the merchandise to be sold is estimated at $1,281,000. Incidental installation costs, sheet metal work, piping, brick work and labor will amount to an additional $493,000.

AUGMENT SALES FORCE

To carry out this extensive campaign the present sales force of the company will be augmented by the addition of eighty-five trained salesmen, bringing the total sales force on the outside up to 119.

The men employed are on varying compensation arrangements, depending upon what specialty they will be selling. A straight salary and bonus will be in effect for men on industrial gas. Certain of the salesmen selling hotel and restaurant equipment will be on a salary and bonus, while others, namely those selling gas-fired ranges to replace coal and oil, will be paid a salary and commission on sales. Radiant type heater and small town domestic water heater crews will receive a guaranteed minimum salary and 20 per cent commission in addition to a transportation allowance.

Every salesman will be brought into the home office and given a week of intensive training before he is sent into his territory. Once under way, the sales plan will be rigidly adhered to, and rules governing outside representatives include: a minimum number of interviews per week; a follow up on every prospect secured; a call back on every sale after the installation has been completed.

The conclusions to be drawn from a perusal of the plan, as pointed out by Mr. Fisher, are: The sales and advertising expense will exceed one million dollars. This is to be a sales year with favorable and attractive rates to the consumer.

The question of competition as between the company and dealers, or between individual dealers, is not an issue in the new program, which is designed to set up a forceful competition with other industries for a fair share of the consumer's dollar.

Following the detailed outline of the plan by P. G. and E. sales executives, as above reported, many dealers and others of the gas and allied industries spoke briefly from the floor, and expressed approbation and willingness to co-operate with the plan in its entirety.

Frank Runyon, president of the California State Furniture Dealers Association, and Wm. P. Goss, president of the San Francisco Master Plumbers Association, were among those who endorsed and bespoke co-operation for the plan.

Community Natural Sets Up New Business Dept.

A NEW business department has been created by the Community Natural Gas Company of Dallas, Texas, to handle the sale of gas appliances in the 115 towns throughout Texas which are served gas by this utility.

A liberal payment plan will be inaugurated by the company for appliances sales to customers and in some instances the actual piping of the homes may be arranged for on the monthly payment plan.

The territory covered by the Community Natural Gas lines has been divided into districts and each district office will be a supply point for the towns within its territory. Greenville, Sweetwater, Temple, Bryan, Colorado, Terrell, Vernon, Electra, Ballinger, Sulphur Springs, Bonham and Brownwood have been selected for district offices and the work of supplying these places with appliances is already well under way.

Each town over the entire system will be provided with an adequate display room, but much of the sales activity will be handled from the district offices. G. L. Armstrong has been appointed new business manager.

CITIES SERVICE HAS BIG 1927 CUSTOMER OWNERSHIP TOTAL

The year 1927 was a good one for customer ownership on the Cities Service Company properties, with a total of nearly $20,000,000 worth of securities sold. Two employees' campaigns were held in practically every department of the Doherty organization. During the first sale a total of 99,311½ shares were sold and in the last sale a total of 99,928 shares, making a total of 199,240 shares for all the properties for the year.

REPLACE VENTURA MAINS

For work now going on in the replacing of distribution mains and services in its Ventura, Calif., district, the Southern Counties Gas Company is spending $80,000.

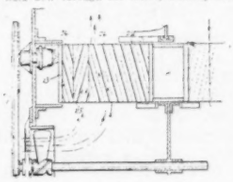
THIS MONTH'S PATENTS PERTAINING TO THE INDUSTRY

1,653,536. GAS TIP AND PROCESS FOR PRODUCING CARBON BLACK. Clyde A. Barbour, Jr., Monroe, La. Filed Oct. 1, 1926. Serial No. 139,010. 2 Claims. (Cl. 134—60.)

1. A gas tip or jet with a head having a slot therein for spreading gas as it issues therefrom into a flat mass, means for conducting gas to said slot, said head also having air channels therein which are not in communication with said gas conducting means, said air channels having their outlets positioned on both sides of and near said slot and extending substantially the whole length of said slot.

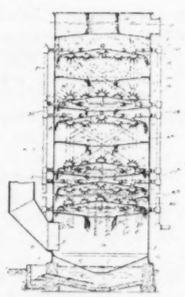
1,654,294. REGENERATIVE AIR OR GAS PREHEATER. Fredrik Ljungstrom, Lidingo-Brevik, Sweden, assignor to Aktiebolaget Ljungstroms Angturbin, Stockholm, Sweden, a Corporation. Filed Aug. 3, 1922, Serial No. 579,345, and in Sweden Jan. 30, 1922. Renewed Sept. 27, 1927. 15 Claims. (Cl. 257—6.)

1. In a heat exchange apparatus, the combination with a framework, means including inlet and outlet passages for causing a body of heating fluid to flow through said framework, means including inlet and outlet passages for causing a body of fluid to be heated to flow through said framework and means causing relative motion between said passages and framework, of regenerative material comprising metallic members mounted in said framework to form a plurality of channels extending from said inlet to said outlet passages at an angle to the general line of fluid flow through the latter, whereby said fluid



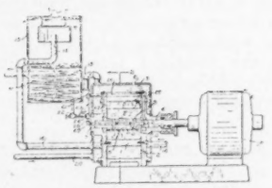
bodies are subdivided while passing through said framework into a plurality of small streams moving at an angle to the general line of flow through said passages.

1,655,171. LIQUID AND GAS CONTACT APPARATUS. Frederick H. Wagner, Baltimore, Md., assignor to The Barrett Hayward Company, Baltimore, Md., a Corporation of Maryland. Filed June 17, 1925. Serial No. 37,793. 6 Claims. (Cl. 261—111.)



1. In an apparatus of the character specified, the combination of a casing provided with ports for the inflow and outflow of gas, a series of intercommunicating chambers formed therein, means for producing a series of interspersed counter-flowing jets of liquid in at least one of said chambers, and means for causing the liquid thus sprayed to pass into the chamber next below in a subdivided condition.

1,653,814. ROTARY COMPRESSOR. William E. Mild, Mount Vernon, Ohio. Filed Jan. 2, 1926. Serial No. 78,821. 1 Claim. (Cl. 230—205.)



In a rotary gas compressor, a casing, a rotor hub in the casing formed with radial cavities and having a hollow center in communication with the latter, outwardly movable blades in said cavities to compress gas in said casing, an oil separator in communication with said casing to receive compressed gas and oil therefrom, a cooling coil in said separator for the oil separated from the gas, an oil outlet pipe projecting downwardly from said coil, a T connected to the outer end of said pipe, a pipe line leading from one end of said T to the interior of the casing and a second pipe line leading from the remaining end of said T to the hollow center of the rotor hub to pass oil therethrough to the blade cavities to force said blades outwardly against the interior surface of the casing wall, for the purpose specified.

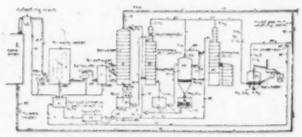
1,653,931. GAS-PURIFICATION PROCESS. Frederick W. Speer, Jr., and David L. Jacobson, Pittsburgh, Pa., assignors to The Koppers Company, Pittsburgh, Pa., a Corporation of Pennsylvania. Filed May 19, 1925. Serial No. 31,457. 8 Claims. (Cl. 23—3.)

8. The method of converting sodium thiosulphate formed in gas purification liquors to sodium carbonate which consists in subjecting the thiosulphate to high temperature furnace heating, and then mixing the resultant fused mass with carbonaceous material and limestone, and subjecting the mixture to a further high temperature furnace heating to convert the aforesaid mass to sodium carbonate.

1,655,981. PROCESS OF MAKING BRIQUETTES CONTAINING PHOSPHATE ROCK. James A. Barr, Mountpleasant, Tenn., assignor to The International Agricultural Corporation, New York, N. Y., a Corporation of New York. Filed Apr. 9, 1924. Serial No. 705,403. 1 Claim. (Cl. 23—223.)

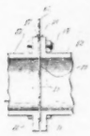
The steps in the process of making a substantially water-proof briquette which comprise mixing about six parts of ground phosphate rock, two parts of pulverized coal and two parts of silica, forming the mixture into a briquette and heating the briquette to approximately red heat

1,654,782. TREATMENT OF FUEL GAS. Eugene H. Bibb, Pittsburgh, Pa., assignor to The Koppers Company, Pittsburgh, Pa., a Corporation of Pennsylvania. Filed Jan. 2, 1923. Serial No. 610,110. 11 Claims. (Cl. 23—196.)



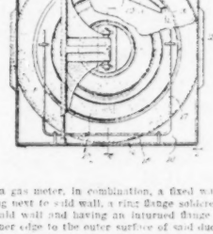
11. A process for the treatment of fuel gas containing hydrogen sulphide, carbon dioxide and other impurities consisting in washing the gas with a non-volatile solution capable of absorbing simultaneously hydrogen sulphide, carbon dioxide and ammonia from said gas and then subjecting the liquid from the absorption stage first to a distilling operation to remove ammonia, and then to heating under regulable pressure to remove the aforesaid impurities, the liquid being thereafter recirculated to the absorption stage.

1,654,559. ORIFICE PLATE. Jacob M. Spitzglass, Chicago, Ill., assignor to Republic Flow Meters Company, Chicago, Ill., a Corporation of Illinois. Filed May 20, 1922. Serial No. 562,312. 4 Claims. (Cl. 137—75.)



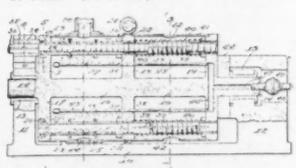
2. The combination with pipe sections having opposed ends, of a perforated disk interposed between said ends and a plurality of circumferentially spaced, radial members on said disk extending outwardly therefrom in angular relation to each other to positions outside of said pipe sections to enable said disk to be properly located between said pipe sections, said members having means for engaging said pipe sections to determine the radial position of said disc relative to said pipe sections.

1,655,654. GAS METER. George A. Lane, Chicago, Ill. Filed May 28, 1927. Serial No. 178,955. 6 Claims. (Cl. 73—1.)



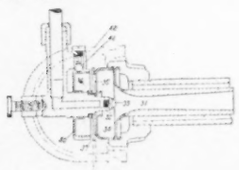
1. In a gas meter, in combination, a fixed wall, a flat duct lying next to said wall, a ring flange soldered at one end to said wall and having an inturned flange soldered at its inner edge to the outer surface of said duct, and a diaphragm bellows secured to the outer side of said first mentioned flange.

1,655,534. FUEL-BRIQUETTE FORMING AND DRYING MACHINE. William C. Carpenter, San Francisco, Calif. Filed Mar. 18, 1926. Serial No. 95,622. 14 Claims. (Cl. 25—12.)



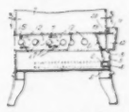
1. In a briquette forming and baking machine, an elongated tubular die, longitudinally disposed ribs arranged on the inner surface of said die at its receiving end and pointed members extending through the wall of said die in longitudinal alignment with said ribs.

1,652,525. INJECTOR FOR GAS BURNERS. George Keith, London, England, assignor to James Keith & Blackman Company Limited, London, England, a British Company. Filed Feb. 11, 1926. Serial No. 87,538, and in Great Britain Feb. 24, 1925. 1 Claim. (Cl. 158—118.)



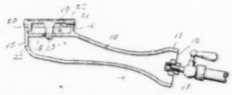
An injector for gas burners comprising a Venturi tube, a gas nipple at one end of said tube, a nipple holder carrying said nipple, said holder being removably fitted in position coaxial with said tube, an apertured cap applied to said nipple holder and bearing on the same end of said tube, said cap surrounding said nipple, an apertured shutter bearing on the outer end of said cap and rotatable on said holder, stops co-operative with said shutter to hold said shutter either in a position with the shutter apertures in register with the cap apertures or with the shutter masking the cap apertures, a second cap mounted on said holder behind said shutter, said second cap adjustable along said holder towards and from said shutter, and means for locking said second cap temporarily in any selected position of adjustment.

652,737. GAS COOKING AND HEATING OVEN. Annie Alice Scott, Earnest Herbert Scott, and Percy Randall Scott, Christchurch, and Ethel May Scott, deceased, Christchurch, New Zealand, by John William Macdonald, administrator, Wellington, New Zealand, said Macdonald assignor to said Annie Alice Scott, Earnest Herbert Scott, and Percy Randall Scott. Filed June 7, 1927, Serial No. 197,168, and in New Zealand May 18, 1926. 2 Claims. (Cl. 126—272.)



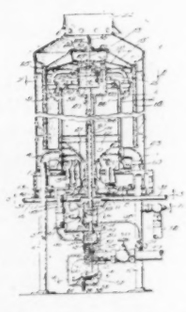
1. A gas oven having a wall provided with secondary air intake openings, a burner extending along said wall on its inner side at a point below said openings, a transverse flue on the outer side of said wall above said openings and having a discharge opening, flues in opposite sides of the oven leading to said transverse flue and having openings for the discharge of impure air from the oven and a baffle spaced from the first named wall, extending above said burner to cause secondary air to be drawn downwardly to the burner and to pass between the same and the lower side of the baffle into the oven, said baffle extending continuously across the oven to the said side flues.

1,653,285. GAS BURNER. Louis D. Houlis, Dallas, Tex. Filed May 17, 1927. Serial No. 192,004. 2 Claims. (Cl. 158—99.)



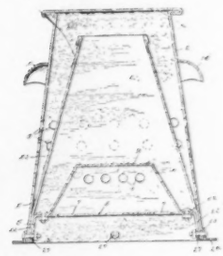
1. In a gas burner, a gas and air conductor, a distributing chamber having an upstanding flange surrounding its upper end and provided with an orifice in its bottom receiving the gaseous mixture from the conductor, a burner cap having an annular boss on its under side provided with radial channels resting on the flange of the chamber, lugs depending from the cap and engaging the flange to hold the cap against lateral displacement, and a tapered stud depending from the cap and partially filling the orifice of the chamber.

1,654,175. WATER HEATER. George G. Kitzeman, Chicago, Ill. Filed Dec. 7, 1925. Serial No. 73,778. 10 Claims. (Cl. 122—156.)



1. A water heater including a fire, a second flue, in the form of an inverted cup, surrounding the first flue and spaced apart therefrom at the upper ends of said flues, and a third flue surrounding and laterally spaced apart from the second flue and communicating with the lower end of the second flue, a water heating gas burner positioned to have products of combustion pass therefrom through the first aforesaid flue, a passage for the water to be heated positioned to be subject to the heat of the products of combustion rising from the burner and passing between the first and second flues, a by-pass opening in the top wall of said cup, a valve for said opening and open when the heater is not in use, a valve for the water heating gas burner and closed when the heater is not in use, and means, operated by the water flowing when the heater is in use to close the first valve and open the second valve.

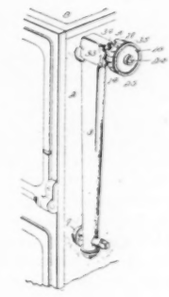
1,655,658. GAS HEATER. Edward Nater, San Francisco, Calif. Filed Mar. 22, 1927. Serial No. 177,328. 2 Claims. (Cl. 126—99.)



1. An article of manufacture, a gas heater comprising an outer shell closed at its upper end and having openings formed around the lower portion of its sides, a baffle member nested within the outer shell and open at the top thereof, and an apertured bottom shell nested within the baffle member to protect said outer shell and baffle from direct exposure to a burner below the apertured bottom shell.

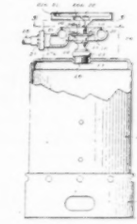
1,656,010. OVEN-HEAT REGULATOR. Benjamin E. Meacham, Lorain, Ohio, assignor to American Stove Company, St. Louis, Mo., a Corporation of New Jersey. Filed Oct. 23, 1925. Serial No. 64,395. 3 Claims. (Cl. 236—15.)

1. A thermostatic regulator comprising a rotating revolvable rod and a two-part wheel applied to the rod having its inner end cooperating with a thermostatically operated member, the inner part secured to the rod, the outer end of the rod and the outer part having coarse openings to prevent relative rotation, the end of the rod having a screw opening, the outer surface of the inner



member provided with projections substantially throughout its surface and the inner surface of the outer member provided with engaging projections, and the screw passing through the opening in the outer member into the said opening in the rod, whereby the parts operate as described.

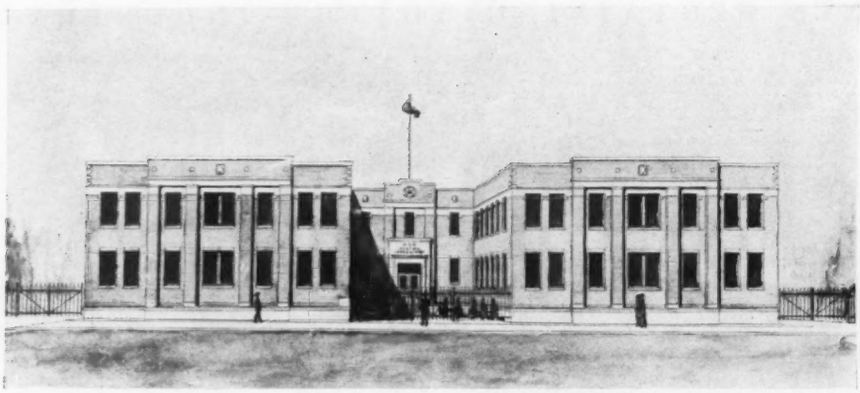
1,632,587. MOUNTED GAS HEATER. Nicholas Busenati, New York, N. Y. Filed Nov. 15, 1926. Serial No. 148,537. 4 Claims. (Cl. 126—230.)



2. The combination with a boiler having an apertured top, of a standard mounted in said apertured top, a plate connected to the upper end of said standard, a flange intermediate the ends of said standard and a burner supported by said flange and disposed beneath said plate.

1,632,405. ARRANGEMENT OF THE GAS AND AIR PASSAGES IN REVERBERATORY FURNACES. Hermann Moll, Rasselstein, near Neuwied, Germany. Filed May 6, 1922, Serial No. 559,071, and in Germany May 20, 1922. 1 Claim. (Cl. 153—7.)

A regenerative furnace comprising a shallow air passage inclined downwardly toward the hearth of the said furnace and consisting of a straight air-directing portion and a wider shallow mixing portion having parallel walls, and a gas passage narrower than the air-directing portion of the said passage entering the mixing portion of the said air passage vertically from the bottom adjacent to the air-directing portion of said air passage.



Artist's sketch of future home of A.G.A. Laboratory

Plans Complete *for* New Laboratory Building

APPLIANCE testing activities now being carried on in the present building in Cleveland occupied by the American Gas Association Testing Laboratory will soon be conducted in the new permanent home of the Laboratory, which will be situated on East 62nd Street about 200 feet from the present site. The new building will be erected on land now belonging to the East Ohio Gas Company, which generously donated the present building and a great deal of equipment. R. W. Gallagher, president of The East Ohio Gas Company, is chairman of the Laboratory Managing Committee.

The Laboratory's new home will cost approximately $150,000 to erect complete. It will be absolutely fireproof, constructed of brick walls with steel frame. Present plans call for a building with an office-type front finished with face brick and a factory-type back finished with common brick. All partitions, except possibly those in the offices, will be of steel and clear glass. They will be sectional to give maximum flexibility and to permit of economical rearrangement when the necessity arises.

Gas will be used to heat the building, and refrigeration service will also be given by this fuel.

The outside dimensions of the new building are 101 feet by 130 feet. Gross floor space area of the new structure will be 26,600 square feet, divided approximately as follows: offices, 3,200 square feet; testing, 14,700 square feet; storage, 8,700 square feet.

The Laboratory now occupies approximately 12,000 square feet of floor space. Estimates place 20,000 square feet as the necessary amount in 1930, and the present building is being planned to care for this growth. Provision has been made in the new building to allow for almost unlimited expansion. It will be possible to build additions to the sides of the building, and in so doing keep all testing work as near the ground floor as possible.

As of December 31, 1927, the Laboratory had approved, either from inspection or test, 7,198 models of gas appliances. This figure indicates the extent of the work done during the past two years and a half, and it is estimated that there are probably more than 40,000 additional models of gas appliances yet to be tested.

PROGRESS ON ARRANGEMENTS TO SERVE NORTH VANCOUVER

Officials of the gas department of the British Columbia Electric Railway Company and members of the North Vancouver, B. C., city council have practically come to an agreement for introducing gas to that community. The city council has expressed willingness to permit the company to go ahead, provided it undertakes to spend $40,000 during this present year.

The company, on the other hand, has stated it is prepared to spend $50,000 within twelve months, in laying of mains and service piping in North Vancouver, and hence a formal agreement is to be looked for shortly. The $50,000 expenditure will not include the cost of laying about six miles of high pressure main from the Grandview holders of the company to new holders which will have to be erected at North Vancouver.

In order to bring the gas to the city the company will be compelled to bring the main across the waters of Burrard Inlet. Exactly how this is going to be done has not yet been agreed upon. The Inlet is already bridged, but as the bridge is of the draw type, and has to be opened daily for shipping, it does not appear to present any solution of the problem.

SUPPLEMENT DALLAS SUPPLY

The Dallas Gas Company has made connection with the lines of the Latex Gas Company supply, which comes from east Texas and Louisiana, as an emergency measure to protect Dallas against fuel shortage in future cold weather.

"WESTERN GAS" ESTABLISHES MID-CONTINENT OFFICE

WESTERN GAS is pleased to announce to its readers the opening of a Mid-Continent office, located in Dallas, Texas. The Mid-Continent office is in the capable charge of Craig Espy, formerly advertising manager of the journal at the Los Angeles publication office. From Dallas headquarters Mr. Espy will make frequent trips throughout the Southwest territory, contacting the progressive gas industry in this rapidly developing section.

The address of *Western Gas'* Dallas office is Room 307 Thomas Building.

Speed Arrangements *for* Dallas Convention

ASSEMBLING in annual convention for the first time since amalgamation with the American Gas Association, natural gas men will gather at Dallas, Texas, on May 7, for a four-day meeting and exhibition. Sessions will be in the Fair Park Auditorium, and the Manufacturers Building will house the varied exhibits of gas equipment and appliances.

Preliminary arrangements for the exhibition are well under way, important details having been settled upon at a meeting held January 17 in Dallas. Those attending were: H. L. Montgomery of the Empire Gas and Fuel Company, Bartlesville, Okla., chairman of the exhibit committee; Elmer Schmidt, Lone Star Gas Company, Dallas; H. C. Morris, manager of the Dallas Gas Company, and chairman of the committee on arrangements for the convention; R. J. Daugherty of the Cities Service Gas Company, Bartlesville; C. W. Berghorn, of New York, secretary of the Manufacturers' Section of the A.G.A.; and George McQuaid, Dallas, secretary, Southwest Division, Natural Gas Department of the A.G.A.

Mr. Berghorn is to have active supervision in arranging for the exhibits, for which more space will be available than in preceding conventions. Blue prints are in the process of being prepared and will be mailed out within a short time to prospective exhibitors.

The personnel of the exhibit committee includes Chairman H. L. Montgomery, Bartlesville; C. C. Cartwright, Ft. Worth, Texas; T. C. Clifford, Pittsburgh, Pa.; H. N. Greis, Tulsa, Okla.; E. F. Schmidt, Dallas, Texas; H. L. Whitelaw, New York, N. Y.; and F. A. Miller, Bradford, Pa.

L. K. Langdon, Cincinnati, Ohio, heads the committee on papers for the Dallas convention; and his committee members are John H. Maxon, Muncie, Ind., and Frank L. Chase of Dallas. The papers committee has announced that suggestions for convention topics should be in their hands at an early date.

The committee on convention arrangements is made up of Henry C. Morris, Dallas, Texas, chairman; Fred M. Lege, Jr., Dallas, Texas, and Charles B. McKinney, Houston, Texas.

N. C. McGowen, Shreveport, La., as chairman of the Natural Gas Department, will presided over an executive committee meeting planned to take place in Dallas shortly, at which meeting other sub-committees for the convention will be appointed.

Last year's convention of the natural gas men was held at Cincinnati.

SOUTHERN GAS AND HOUSTON GAS SECURITIES MERGE

Leroy J. Snyder, President of the Southern Gas Company, which operates in Southwestern Texas, has announced a merger of that company with the Houston Gas Securities Company of New York. The transaction involved more than $4,000,000, according to report.

The terms of the merger provide that 55,000 shares of the common stock of the Southern Gas Company be turned to the Houston Company, a holding organization for the Empire Power Corporation of New York. The Western Gas and Fuel Co., and the Southern Gas and Utilities, subsidiaries of the Southern Gas Co., are to be included in the transfer. The daily output of the combined companies will be in excess of 100,000,000 cubic feet.

WEST COAST MEETING PLANNED BY STEEL TREATING MEN

The American Society for Steel Treating is arranging for the first time in its organization history to hold one of its semi-annual meetings on the Western Coast, the dates being January 14 to 18 inclusive, 1929, at Los Angeles.

Ten technical sections will meet, with some 40 to 45 papers being presented. In connection with the meeting will be held the "Western States Metal and Machine Tool Exposition," as the exhibits customarily held with the Society's sessions will this year be called. The complete cycle of steel, from the raw material state to the finished product and its testing, will be shown.

Co-operating with the American Society for Steel Treating in the staging of this Western gathering are the following organizations:

American Institute of Mechanical Engineers, American Petroleum Institute, American Welding Society, Institute of Metals, Pacific Coast Gas Association, Pacific Coast Electrical Association, National Metal Manufacturers Association.

NEW OFFICES FOR OKLAHOMA UTILITIES ASSOCIATION

The Oklahoma Utilities Association has moved its offices from 307 Local Building to 1020-23 Petroleum Building, Oklahoma City. It now occupies a suite of four rooms with full equipment for its activities.

The Association embraces all branches of the public utility industry and applies its efforts to the solution of problems in which the public utility companies have common interest. Edward F. McKay is manager of the Oklahoma organization.

McCARTY HEADS POTRERO PLANT

Dan J. McCarty, for many years superintendent of gas production at the Potrero, San Francisco plant of the Pacific Gas and Electric Company, under the late James M. Dickey, gas engineer, has been placed in charge of gas making operations at that station. While his duties will be the same as those of his predecessor, the title of gas engineer has been abandoned for that of superintendent. Mr. McCarty has been continuously in the service of the P. G. and E. since 1907.

B. C. ELECTRIC RAILWAY HAS HEAVY SENDOUT

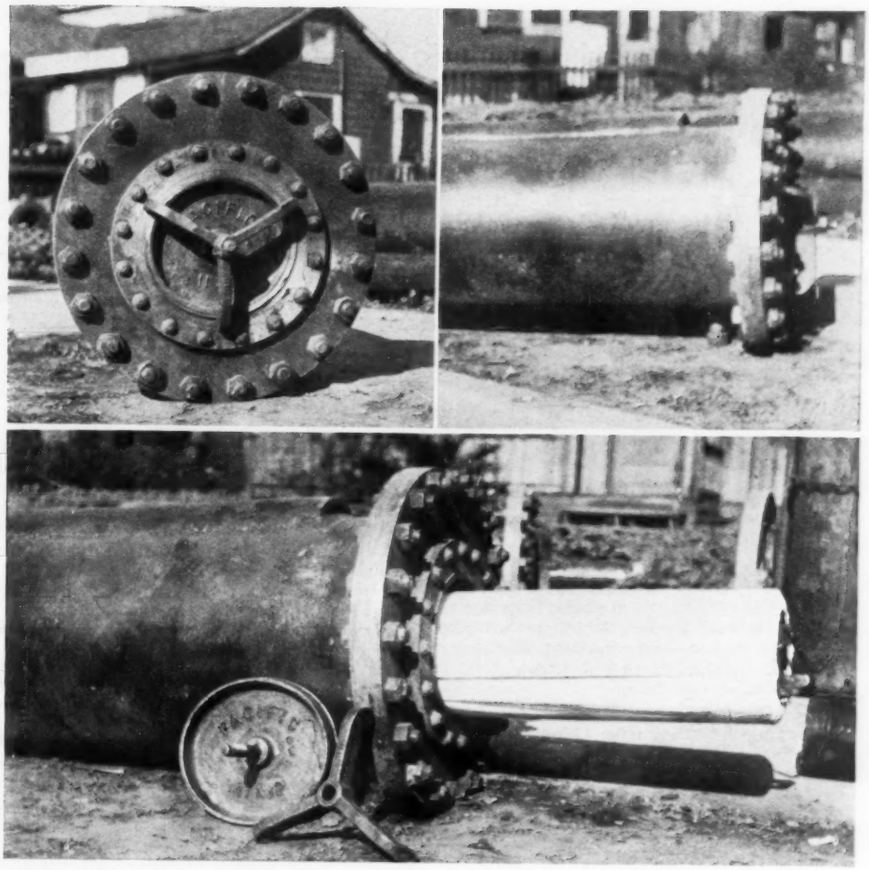
On December 9 the gas department of the British Columbia Electric Railway Company touched a new high peak by sending out 3,750,000 cubic feet of gas. This record demand was during a severe cold snap. In spite of the number of trouble calls a gas company in this section naturally expects at this time of the year from frozen service piping, the trouble department of the company reports less calls than during the corresponding period last winter when much less severe weather was experienced.

MID-WEST GAS ASSOCIATION IN YEARLY CONVENTION

Announcement has been made of convention dates for the Mid-West Gas Association by A. W. Schmitt, secretary-treasurer of the organization. The Mid-West men will meet this year at Lincoln, Neb., April 18-19-20, with headquarters at the Cornhusker Hotel.

ENID SHORT OF GAS

Gas shortage is facing Enid, Okla., and other towns in the vicinity, due to intrusion of salt water into wells of the Deer Creek field.



Top, left: Front elevation of dust pot, hand-hole plate in place. Top, right: Side elevation of dust pot, showing inlet and outlet connections. Bottom: Side elevation of dust pot, hand-hole plate removed and cartridge exposed.

Quick-Opening Hand-Hole Plate *for* Large Dust Pots

By W. M. HENDERSON

Superintendent of Distribution

Los Angeles Gas and Electric Corporation

THE type of dust pot used by the Los Angeles Gas and Electric Corporation is a modification of a very successful pot designed and used by the San Diego Consolidated Gas & Electric Company.

The practice is to install these dust traps on the trunk lines, preferably at governor locations where large volumes of gas are delivered to the distribution system. The design is illustrated in the pictures. It is made from 20-inch pipe, approximately six feet long. On one end is a welded companion flange with bolted flange-plate, on the other end a torpedo head. The inlet is a 6-inch nipple welded on the side of the torpedo head. Internally there is a cartridge nine inches in diameter, made by fabricating a steel web over which is wrapped a steel screen about four mesh. This forms a cartridge which is covered by an envelope of high grade muslin that is easily slipped over the cartridge and tied by draw-strings. The cartridge rides on a bronze rod in order to withdraw it from the dust pot.

Access to the pot must be convenient for frequent inspection. This feature is made possible by the application of the Pacific Hand-Hole Plate to the face of the flange-end of the dust pot. The Pacific Hand-Hole Plate is a ground-face gas-tight plate, in some respects similar to the design of a hand-hole plate on a boiler, except that a gasket is not necessary to maintain a gas-tight joint. Even the yoke is not essential to hold the plate in place, as the pressure of the gas on the back of the plate keeps the tapered face snug and tight. A yoke, however, was adopted as a part of the installation of the dust trap, as a safety precaution, because there was a possibility of striking the face of the hand-hole plate and loosening same while the pot was in service. The yoke prevents this and it is a simple addition to the hand-hole plate.

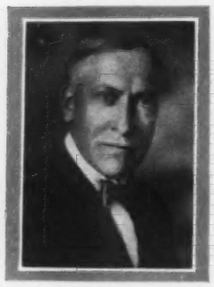
The pictures illustrate the application of the Pacific Hand-Hole Plate to a dust pot and indicate how convenient it is to gain access to the inside for the inspection of the muslin-covered cartridge and for the removal of dust.

MORE GAS FOR SAME MONEY IN WINSLOW, ARIZ.

Gas consumers in Winslow, Ariz., may use 1000 cubic feet of gas instead of the former 750 cubic feet, for $2.50, as a result of action of the city council regulating municipal gas department's rates. The change is expected to increase consumption of the larger users.

Hornberger General Mgr. Arizona Edison Company

WILLIAM C. HORNBERGER, assistant manager of the Central Arizona Light and Power Company of Phoenix, Ariz., and connected with that utility for the past 26 years, has been named vice-president and general manager of the Arizona Edison Company, subsidiary of the Peoples Light and Power Company of New York, a holding company of G. L. Ohrstrom and Company, Inc.



W. C. Hornberger

The Arizona Edison Company was recently formed to take over management of a number of utility properties in Arizona communities, including Globe, Bisbee, Douglas, Yuma, Miami, Safford and Thatcher. The first four named include four of the eight gas manufacturing plants in the state. State offices for the Arizona Edison Company will be maintained in Phoenix in the Home Building, with branch offices in each point of operation.

Mr. Hornberger, who is active in the proceedings of the Pacific Coast Gas Association and is at present a director of the Association, was born in Michigan and is a graduate of Ann Arbor, holding a degree of bachelor of science in mechanical engineering from that institution. After a short period of time with consulting engineers in Detroit, Mr. Hornberger went to Phoenix to take the position of switchboard wireman for the local utility there.

During his stay in Phoenix and his promotions through various executive positions Mr. Hornberger designed, built, and developed the Phoenix gas plant which is one of the best in the southwest and the largest in Arizona.

With the Central Arizona Light and Power Company Mr. Hornberger has been successively general superintendent, assistant secretary, and assistant general manager. He is president of the Arizona Utilities Association, and also president of the Salt River Valley Electrical League, as well as a director of the P. C. G. A.

Announcement of Mr. Hornberger's appointment to this important post was made late in January by E. C. Deal, president of the Peoples Light and Power Company, who spent some time in Arizona last month.

OPEN HOUSE FOR PORTLAND EMPLOYEES IN NEW HOME

An open house for employees of the Portland Gas & Coke Company was held in the company's new quarters in the Public Service Building, on December 20, well in advance of the building's public opening, which came on January 3. A reception to the employees was held in the offices of Guy W. Talbot, president of the utility, and during the reception Mrs. Talbot raised the American flag over the building, which constituted its official dedication.

On January 3 came the public opening of the building during the day and evening of that date. Two orchestras were provided during the evening, and employee ushers guided a constant stream of visitors over the various floors and departments.

CADET COURSES FOR P. G. AND E. EMPLOYEES

A Cadet course for salesmen to be selected from the most promising young employees of the company has recently been inaugurated as part of the P. G. and E. personnel program.

At present the plan is in force in the San Francisco and East Bay Divisions, with five men going through the six-weeks course. It is the endeavor of the course to familiarize the cadets with every phase of gas company operation, and to this end they spend a certain amount of time in every department.

At the end of this time those completing the work in a satisfactory manner are incorporated into the sales organization of the company.

FORT WORTH RATE RAISE NOW UP TO COMMISSION

The application which the Fort Worth Gas Company filed with the city of Fort Worth, Texas, for an increase in domestic rate has been referred by the utility to the Texas Railroad Commission for more speedy action. Under the increase sought the first 1,000 cubic feet of gas would cost the consumer $1.50 against the present rate of .67½c net.

GAS ACROSS BORDER

A concession to serve natural gas to Matamoros, Mexico, has been granted to a company capitalized at $50,000, and composed of Jose Martinez of Brownsville, Texas, Eufrasio Perez, Emiliano Fernandez and J. Montmayer of Matamoros. The gas will be taken across the International bridge at Brownsville through a 6-inch line, and will be supplied by the Rio Grande Valley Gas Company.

PUEBLO UTILITY PLANS TO SPEND $380,000 IN 1928

A. M. Talbot, manager of the Pueblo Gas and Fuel Company, Pueblo, Colo., states that his company has a $380,000 compaign of additions and betterments in prospect for 1928, hingeing somewhat upon the decision of gas rates to follow introduction of natural gas on completion of the Interstate Gas Company's line to Denver, which will also provide Pueblo with natural gas supply.

Items in the improvement program are a new high pressure feeder main near the Colorado Fuel and Iron Company's plant, strengthening of pipe joints in the existing distribution system, renewal of many lateral lines, installation of many station, house and building meters, and purchase of ditching equipment.

This 1928 expenditure is the beginning of a 10-year program for gas system betterment in Pueblo.

MAY SELL MIAMI PLANT

At a special election of February 7 voters of Miami, Ariz., will pass upon the sale of the city's gas plant to the Peoples Gas and Electric Company which is understood to have offered $126,000 for it. The city council passed a resolution favorable to sale of the plant early in January.

OKLAHOMA GAS UTILITIES HAS BIG DRILLING PROGRAM

The Oklahoma Gas Utilities Company has announced a development program on the company's properties in the Chickasha gas field to include the drilling of 26 additional wells. This will make 44 producing wells in addition to those which are now connected with pipe lines. It is expected that this program will be completed within the year.

PROPOSE REORGANIZATION OF A. G. R. MFGRS. SECTION

Reorganization of the Manufacturer's Section of the American Gas Association, with a view to tieing the manufacturers closer to the A. G. A. and to the industry, was proposed at a recent meeting of the Section, held at New York.

The plan of reorganization offered calls for formation of a conference made up of delegates from each group of manufacturers engaged in the same lines of business. The conference of delegates would meet not less than four times a year, on call of the chairman of the Manufacturers Section, at various points in the country to be selected. Each group would choose its own delegates. General conduct of the conferences would be held under the jurisdiction of the Managing Committee of the Manufacturers Section, whose chairman would preside over them.

As soon as details have been formulated the plan will be presented in full to the industry's manufactures, and requests for the selection of delegates from the various groups will be issued.

NEW MANAGER AT STOCKTON

H. B. Heryford, division manager of the West Side Division of the Pacific Gas and Electric Company, with headquarters at Red Bluff, Calif., has been appointed successor to the late Charles S. Northcutt, formerly district manager of the company at Stockton.

H. B. Heryford

Mr. Heryford has been connected with the gas and electric industries in California for the past 25 years. He was born in Lincoln, Calif., and started his career in the gas and electric business at Colusa, where he entered the employ of the Colusa Gas and Electric Company in March, 1903. Three years later he was made manager of the company. In 1909 he was promoted to manager of the Chico district of the Pacific Gas and Electric Company, and was transferred to the West Side Division in 1921.

NEW OFFICES IN BANNING

Southwestern Gas & Fuel Company moved to new offices in Banning, Calif., on January 2. New offices are in the Jost Building on San Gorgonio avenue. Communities served by the company include Banning, Beaumont, Hemet and San Jacinto. Recent introduction of natural gas in these towns is causing a rapid development in the househeating load, according to the company.

APPLIES TO BUILD LINE TO VERNAL CITY, UTAH

Orman W. Ewing of Salt Lake City, Utah, has applied of the state public utilities commission for authority to construct a natural gas pipeline from the property of the Ashley Valley Oil Company in Uintah county to serve Vernal City.

SAN DIEGO UTILITY PLANS BETTERMENTS

San Diego Consolidated Gas and Electric Company will construct feeder mains for improvement of service in LaJolla, Point Loma, and Old Town districts, as a part of its 1928 betterment program.

STONE HEADS BUSINESS BODY

James L. Stone, vice-president and general manager of the Spokane Gas and Fuel Company, was elected president of the Spokane, Wash., chamber of commerce in its January election.

DAVIES IN CALIFORNIA

J. E. Davies, manager of the Peoples Gas Stores, merchandising arm of the Peoples Gas Light and Coke Company, Chicago, is in southern California at present for a stay of several months duration.

WATER HEATER CAMPAIGN TO BEGIN MARCH 15

On March 15 the Southern Counties Gas Company is scheduled to begin a water heater campaign on its southern California system, with the object of making progress toward its goal of 2,000 heaters to be sold in 1928. Last year the utility disposed of 1,100 water heaters.

Early in February the same company began a direct-by-mail campaign on all gas appliances, breaking down sales resistance for its direct selling.

BYLLESBY HOLDS FIRST SALES AND ADVERTISING CONFERENCE

Forty-five sales and advertising executives from various Standard Gas and Electric Company properties attended Byllesby Engineering and Management Corporation's first sales and advertising conference, held January 23-25, at the Palmer House, Chicago. Increasing sale of gas and electricity through existing facilities, and forms of service improvement, were keynotes of the conference, which was presided over by W. H. Hodge, vice-president and manager sales and advertising department, Byllesby Engineering and Management Corporation.

GAS FOR ST. JOSEPH, MO., IS $1,000,000 DEVELOPMENT

The Cities Service Company is spending $1,000,000 to bring natural gas to St. Joseph, Missouri, from Leavenworth, Kansas, where the line, tieing in there, will cross the Missouri River. Pipe for this line was ordered about the middle of January.

"OLD GUARD" BANQUET

Los Angeles Gas and Electric Corporation's "Old Guard," made up of employees of 10 years or longer with the company, held its sixteenth annual banquet at the Biltmore Hotel in Los Angeles, in January. Membership now numbers 345.

BYLLESBY ENGINEERS MEET

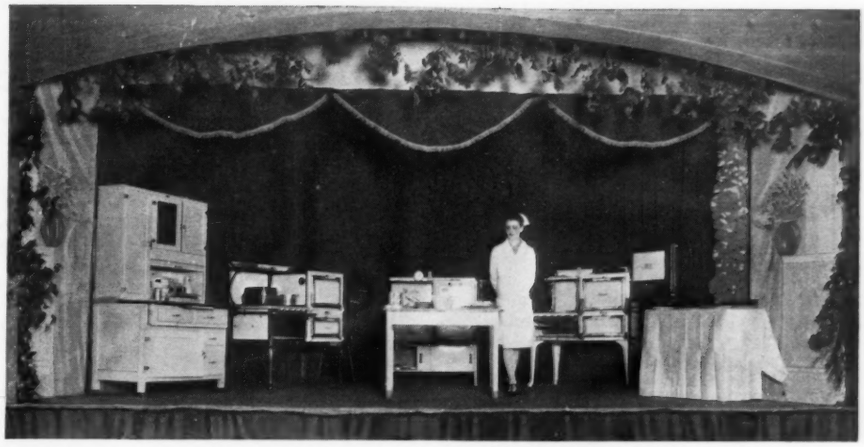
February 14 to 17 will find Byllesby Engineering and Management Corporation engineers gathered in their third annual convention, to be held in Chicago. About 70 are expected to attend.

GAS IN FORT SILL AND LAWTON

The new 10-inch gas line of the Mid-West Gas Company extending from the Grady county field to the Fort Sill, Okla., power plant has been completed and gas has been turned into the main, according to Paul S. Pierson, division superintendent of the company. Lawton and Fort Sill have secured gas through the new line.

SIGNAL GASOLINE ADDS 15,000-GALLON UNIT

The Signal Gasoline Company has added a 15,000-gallon unit to their Signal Hill absorption plant, No. 2. The installation was made by J. A. Campbell, the equipment being of Campbell design and construction.



South Vancouver, B. C., home service demonstration.

Home Service Department Launched *by* B. C. Electric

The gas department of the British Columbia Electric Railway Company has formed a home service department. This department is under the charge of Miss Isabella Smith, domestic science expert and graduate of McDonald College, Montreal.

Under the direction of Miss Smith it is the intention of the company to stage gas cooking demonstrations in various sections of the territories which it serves. The first demonstration was recently held for a three day period in St. Patrick's Hall, South Vancouver.

Extensive Sales Organization Launched *in* No. California

THE HOT-N-KOLD Corporation, a mother company for Hot-N-Kold shops that will carry on extensive merchandising activities in gas and electric appliances throughout the entire northern part of the state of California, has recently been launched by C. H. Dickey, Jr. and W. D. Dickey, in San Francisco.

The new corporation is capitalized at $250,000 and 90 per cent of the stock is in the hands of the Dickey brothers. The sales program that the new corporation contemplates will be in a large measure the same type of activity that the gas companies are engaged in in localities where merchandising is a part of the utilities' activity.

Acting as a mother company, and owning 51 per cent of the stock of the Hot-N-Kold shops throughout the territory to be served, the corporation plans to sell 49 per cent of the stock in each individual store to local capital. Plans now under way assure the establishment of Hot-N-Kold Shops at Oakland, San Francisco, Stockton, Sacramento, San Jose and Fresno, respectively.

In Oakland the organization is already functioning, with a location at 232 14th street. E. J. Holden, a former crew manager on special campaigns with the P. G. and E., is in charge. A definite location has been contracted for in San Jose, with C. E. Hershey and W. D. Leary handling the electrical and gas appliance sales. Within a few weeks, according to C. H. Dickey, Jr., all six of the original shops will be open for business.

In addition to the specific and exclusive Hot-N-Kold Shops, there will be merchandising establishments in approximately 90 other towns and smaller cities throughout the northern part of the state that will operate under franchises from the main organization, but without discontinuing the identity of the stores already established. None of these franchises have yet been granted.

The corporation itself will act as manufacturers' distributors for various lines of gas and electric appliances, although at the present writing only an electric refrigerator and a gas range have been definitely decided upon. Negotiations are now being carried on to the end that this company will have exclusive sales rights for the territory in which it operates on some make of practically every article that utilizes gas or electricity for the generation of heat or cold.

The Hot-N-Kold Shops proper, will act as sub-distributors of all lines carried, maintaining as far as possible wholesale and retail establishments.

Officers of the Hot-N-Kold Corporation are C. H. Dickey, Jr., president; W. D. Dickey, vice-president and secretary-treasurer. Lee Bagby is sales manager and B. E. Palmgreen is assistant secretary, in charge of purchases.

30-MILE LINE TO PARSONS

The Farout Oil company of Craig county, Oklahoma, is laying a 30-mile gas pipe line from the Oklahoma gas fields to Parsons, Kansas. Gas will be collected from 50 gas wells in northern Oklahoma, and will be piped to Parsons, where it will be used in the M. K. & T. railroad shops.

GOOD-WILL SESSION OF OKLA. UTILITIES BODY

The first of a series of good-will meetings under the sponsorship of the public relations division of the Oklahoma Utilities Association was held at Okmulgee, February 1. Keith Clevenger, Empire Companies, Bartlesville, is chairman of the public relations division and L. P. Arnold, Tulsa, public relations manager for the Public Service Company of Oklahoma, had charge of the Okmulgee program.

COPPER AND BRASS RESEARCH ASSN. WESTERN BRANCH

Timothy Turner has been appointed resident manager of The Copper and Brass Research Association's new western branch, located in Los Angeles with offices in the Architects' Building.

With *the* Metermen

January 26 Meeting

MEMBERS of the Southern California Meter Association met in monthly session on January 26, in the main dining room of the Breakers Hotel, Long Beach. Seventy-nine were present at the dinner and business meeting which followed.

Several items of business were disposed of prior to the program of papers and discussion. H. E. Thompson of the association's by-laws committee read the complete constitution and by-laws, which represent the effective work of this committee. The constitution and by-laws were approved conditionally as read, members having future opportunity to introduce changes after receiving individual copies.

Robert F. Angell of the Los Angeles Refinery, Union Oil Company of California, read his interesting paper on "Measurement of Oil by Orifice Meter," following which there was extended discussion. Samples of the self-contained orifice plates used at the Los Angeles Refinery were exhibited.

Another paper by H. H. Robinson of the Robinson Orifice Fitting Company, descriptive of the company's improved orifice fitting, was also received with interest. Mr. Robinson had a set-up of a new type three-inch high pressure fitting on display, and explained its innovations.

President T. K. M. Smith presided over the January 26 meeting, and C. W. Brockman acted as secretary pro tempore, reading minutes of the previous general meeting and of the board of directors meetings of January 12 and January 20. A dance orchestra provided some very acceptable music during the dinner.

Program Committee Active

ANNOUNCEMENT was made at the January 26 meeting of the Southern California Meter Association that the program committee of the organization plans to outline a five-months program of papers, the papers to be prepared well in advance of the meetings at which they are read. At the meeting of February 23 the paper on "Measurement of Steam by Orifice Meter," by George W. Salisbury, will be offered, and Guy Warden will deliver a paper on "The Republic Orifice Meter."

The six-months arrangement for holding sessions of the association at Long Beach is terminated with the February 23 meeting, at which time selection of future meeting sites will be made by the members.

COMPLETE CROWELL SYSTEM

The gas distribution system in Crowell, Texas, has been completed and natural gas will be turned into the city as soon as the 11-mile pipe line to the field northeast of that city is completed. Fifty-three thousand feet of four-inch pipe were laid within the city, which will completely serve it. Culberson Brothers of Fort Worth hold the city franchise. They also hold the gas franchise at Thalia, 10 miles east of Crowell, and will start work there as soon as gas is supplied to Crowell, which was expected to be some time in January.

Gas Measurement *by* Orifice Meter

By R. A. KEANS

*Union Oil Company of California**

CONSIDERATION of the various types of gas meters prevalent in the natural gasoline industry today reveals that the orifice meter is most widely favored. This popularity is due to the flexibility of range afforded and dependability of operation. By simply changing static pressure springs and orifice sizes the same instrument can be made to measure volumes of gas ranging from a few thousand to millions of cubic feet and from a few pounds to hundreds of pounds pressure.

R. A. Keans

Orifice meters may be segregated into three divisions, the use of the orifice plate being essential to all three, and classification being dependent on recording element used. The three divisions are mercury float type, electrical resistance type and spring, or diaphragm type. The mercury float type, which is in almost universal use, is based on the fundamental principle of the mercury U-Tube, in which pressure applied to one side of the tube depresses the mercury in that side with a resultant corresponding rise in the other side. The mercury float type orifice meter embodies this principle, and with the use of a metal float riding on the mercury and actuating a pen arrangement, fluctuating differential pressures caused by varying rates of flow are recorded on the chart.

Static pressure has a direct bearing in the computation of volumes, and this is recorded on the chart by the use of a helical spring type gauge operating with a recording pen arrangement. Earlier instruments were constructed with the differential and static recording elements in separate cases, but the necessity for compactness developed the present type, combining these two recording elements in a single case.

LOCATING ORIFICE METER STATIONS

In locating an orifice meter station several factors should be taken into consideration, among them being avoiding propinquity to compressors, eliminating valves, regulators and other fittings from the pipe immediately preceding and following the orifice, setting the instrument absolutely level, and locating the instrument as near as possible to the orifice plate.

At the overhaul periods, care should be taken to see that the small hook-up lines are blown out to prevent accumulation of sediment which might form a constriction which could affect the accuracy of the instrument. Valve stems should be carefully watched for leaks. An accumulation of condensate in the mercury chamber, which frequently occurs, especially if the gas being measured is wet, should be guarded against. This can be prevented to a greater or lesser degree by the insertion in the hook-up lines of small chambers filled with excelsior.

Orifice plates should be carefully machined, the orifice itself being accurately bored to the thousandth part of an inch. The orifice should be machined at exact right angles to the up-stream side of the orifice plate, and the center of the orifice, when installed, should be in the exact center of the pipe line. Occasional inspection of orifice plates is recommended, since an eroded orifice may cause a considerable error in the measurement.

Specific gravity of the fluid being measured should be determined as often as possible, preferably not less than once a month, this being especially true of gas produced in newer fields, as gas from older fields is usually of fairly constant density. Temperature determinations should be similarly treated, and in work requiring a high degree of accuracy, barometric pressure should be considered and proper allowance made.

Individual well measurement with the orifice meter is much more feasible than with the Pitot tube or orifice well tester, and although the orifice meter requires that proper hook-up be provided, this will be more than offset in the saving of gas which would otherwise be blown to the atmosphere. The orifice meter method is especially adapted to the measurement of wells producing under a vacuum, since the use of an open-flow method requires blowing a well down, with a resultant loss of gas and power, and then securing a measurement which may not be representative of true operating conditions.

THE PULSATION PROBLEM

Pulsation, which can be caused by a number of factors, must be considered in the measurement of gas by orifice meter. In solving the pulsation problem, we must distinguish between the mechanical vibration of the pen arm, which might be caused by rapid operation of a check valve, for example, and fluctuating differential pressure caused by turbulent or oscillating flow, since pulsation and vibration are often confused. Mechanical vibration may be cured, once the cause is known, by the removal or change in location of the offending check valve or other fitting. Pen arm movement, which is caused by agitated flow, may be counteracted in several different ways. Baffle plates having a number of small holes through which the gas must pass, have been successful. Straightening veins, as the name implies, are used to give the effect of straightening the flow of gas by forcing it to follow a straight line for the length of the vein.

*An abstract by the author of a paper presented before the Southern California Meter Association, December 29, 1927.

The use of bushings, or check valves, in the instrument to retard the movement of the mercury is not recommended, for while this method does tend to produce a steady record, it cannot always be depended upon to produce a true average of an irregular chart record. Large chambers in the meter hook-up lines also produce a deadening effect but still leave the accuracy of the reading in question. Line connections are preferred to flange connections in the measurement of pulsating gas, and although the reason for this is not known, it is presumed to be due to the fact that the line taps, being removed from the orifice plate some distance, do not permit the recording of the full impulse of the pulsations. An accumulation of liquid in gas lines also causes oscillation of flow, but can be simply remedied by the insertion of drips at proper points.

In the elimination of pulsation caused by compressor operation, the removal of the meter to points as far distant from the compressor as is consistent with good operating practice as possible, is recommended.

The Robinson Orifice Fitting

By H. H. Robinson

*Robinson Orifice Fitting Company**

With the construction of the original design of Robinson Orifice Fitting you are all familiar. The principle of this original design has not been changed in any detail by the recent incorporation of new features into the fitting.

These new features have to do with the construction of the plug or by-pass cock. In order to eliminate friction and metal-to-metal freezing of the cock, which have often caused considerable difficulty in turning it, we have designed a lubricating feature. A grease seal has been put on each end of the plug in the form of a grooved ring around the cock. Lengthwise of the plug we have cut grooves that are lubricated through alemite connections from the outside of the body of the fitting, accomplishing complete lubrication of the entire cock and eliminating any metal-to-metal freezing or friction.

On the large end of the brass plug we have placed a quarter-inch standard packing gland which is so designed that the plug cannot be blown out. This gland is held to the body of the fitting by six 3/8-inch cap screws. These cap screws act as a take-up on the packing in the gland, eliminating the possibility of leaks on this side of the fitting.

On the small end of the cock, or dead end, we have constructed a force button. In the construction of this force button we have used a set screw attachment. The set screw works in a steel casting attached to the fitting body by seven 7/16-inch cap screws. In the cock we have inserted a steel button which acts as the seat upon which the set screw works. The steel casting eliminates the possibility of leaks on this side of the fitting when the cock is loosened by pressure from the set screw preparatory for turning.

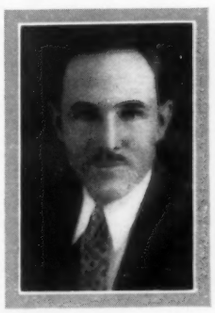
In the operation of the new feature plug it is necessary only to tighten up the set screw to loosen the cock. After the by-pass cock has been turned, the plate changed, and the by-pass closed again it is only necessary to loosen up the set screw on the small end and tap the cock on the opposite side with a hammer or tighten up on the packing gland. The man in the field can readily appreciate that the new cock, through the lubricating and force button feature, entirely prevents the loosening which was encountered with the old cock, and eliminates all leaks about the cock through the incorporation of the packing gland feature.

Oil Measurement *by* Orifice Meter

By Robert F. Angell

*Union Oil Company of California, Los Angeles Refinery**

The orifice meter furnishes us a means for accurately measuring gas, air, steam and water, and also readily adapts itself to the measurement of oil. The orifice meter finds a very useful place around an oil refinery as a measuring and operating instrument and has so far, with us, exceeded all other oil meters in usefulness and reliability. It is a simple, rugged field device; it is flexible in its range; it is sufficiently accurate for all controlling and accounting purposes; and lastly, it is a rate meter and gives a history picture of the day's operation, and a clear picture of what is happening any instant. This is especially important for all continuous processes.



Robert F. Angell

The type of orifice meter used for measuring oil is identical with that for measuring gas and air, except that the static pressure spring may be omitted, as oil is practically incompressible and pressure does not have to be considered. The meter is usually a 50-inch or 100-inch mercury differential recorder, recording in inches of water differential or the square root of the water differential. We have successfully used the Foxboro, the Westcott, and the Republic meters for oil measurements.

In using the orifice meter as an oil measuring device, the orifice plate is inserted in the pipe line where the rate of flow is desired, similar to any other orifice meter installation. This plate is inserted for the purpose of causing an obstruction in the pipe line, and causing a drop in pressure, and a differential pressure between the high and low side of the plate, which is a function of the velocity of the fluid, and from which the flow can be calculated. Orifice plates are of many kinds and descriptions. Any thin plate orifice with a sharp square edge on the up-stream side, and free from burrs, which would be satisfactory for gas measurements, is satisfactory for oil measurements. We, at the Los Angeles Refinery, have developed and used the self-contained orifice plate (See sketch accompanying this article) in most of our oil meter installations, and can recommend it as sufficiently accurate for most purposes and very simple to install. It consists of a piece of steel boiler plate 3/8-inches in thickness, machined to the correct outside and inside diameter, and then two 3/16-inch holes, drilled from the outer edge of the plate toward the center of the plate, to a definite distance from the center. This distance is decided by the size of the pipe line in which the plate is to be used. One hole is then connected to the upstream side of the plate, and the other hole to the down stream side of the plate, by a drill hole also 3/16-inches in diameter. One-quarter-inch pipe connections are then welded onto the plate. The cost of these plates averages approximately $3.50 per plate. These orifice plates have the advantage of being entirely complete, serving as orifice plate and furnishing meter connections. They require no special flanges, call for no tapping of the pipe line, and cannot be put in wrong; but, on the other hand, they can be installed between existing pipe flanges with a minimum shutdown. These plates also make possible ideal meter piping installations when installed in vertical lines, as both connections are then in the same horizontal plane. These self-contained orifice plates have the disadvantage of having rather small orifice connections for some heavy or dirty oils and are apt to become plugged. They also have the disadvantage of bringing in the velocity of approach factor, of which there is still some discussion, but apparently are accurate within the 2 per cent error limit usually allowed for oil measurements.

If self-contained orifice plates are not used, special orifice flanges with the connections in the flange can be used for oil measurements, or the orifice plates can be inserted between a pair of comon pipe flanges and connections tapped into the pipe line. These connections are usually tapped in according to one of the following standards, similar to any other orifice meter installation:

(1) 2½ pipe diameters upstream—8 diameters downstream.

(2) 1 diameter upstream—4½ diameters downstream.

(3) 1 diameter upstream—½ diameter downstream.

There is still a great deal of discussion as to just where these connections should be, and it is hoped that sometime an organization such as ours can decided this and bring about a standardization. Our experiments have shown that for most orifice ratios, the pressure anywhere between one diameter upstream and 2½ diameters upstream is the same, and that the pressure anywhere between 4½ diameters and 8 diameters downstream is the same. We have found that the differential readings for self-contained orifice plates, special orifice flanges, and connections one diameter upstream and one-half diameter downstream are within 2 per cent.

Our work of oil measurement thereby simplifies itself, and we have only two types of connections to consider. They are the close-up or *vena contracta* connections, and the line or after pressure recovery connections. The close-up connections have the advantage of giving larger differential readings and needing a shorter length of straight pipe to be installed in, while the line con-

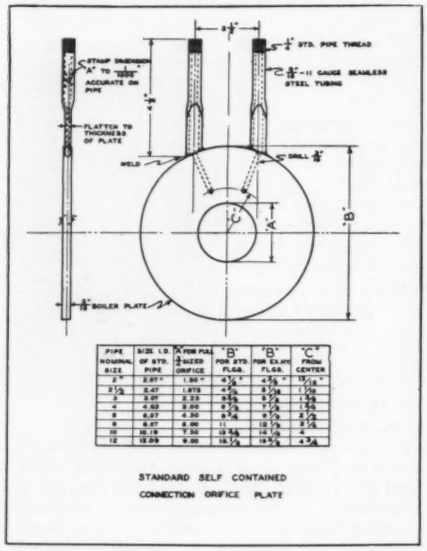
Presented before the Southern California Meter Association, January 26, 1928.

nections have the advantage of being less liable to be affected by turbulence.

We are also fortunate in our work in oil measurements in that all of the coefficients of velocity, sometimes called efficiency factors, which have been established for gas and air and published by the various companies, have been found to be practically the same for water, steam, oil, and non-viscous liquids. For viscous liquids correction factors are necessary, and viscosity multipliers have already been published by the Metric Metal Works. We have used these factors in our oil measurement work, and have extended the curve furnished by them to the best of our knowledge and information for larger viscosity corrections. It is hoped more work can be done to establish a more complete set of viscosity multipliers.

Regardless of the kind of plate used or the type of connections used, the orifice connections should, as in the case of water, steam, and vapors, come out the side of the pipe. This is to avoid an accumulation of gas or air in the meter piping. If the connections are not in the plate or in the flange, ¼-inch or ⅜-inch pipe connections should be tapped into the side of the pipe according to one of the above spacing standards. These connections should be tapped in with care so that the nipples do not project into the pipe, or cause any rough spots inside of the pipe. The orifice plate should be installed in a straight section of pipe with no fittings or obstructions for a distance of 10 pipe diameters from the upstream connection and at least five pipe diameters from the downstream connection. The orifice plate should be installed between a pair of pipe flanges, the pipe of which is made up flush with the face of the flange. The flange and pipe should be free from rough spots which might cause unnatural turbulence. The connecting leads should be as short as possible with convenience, and tees should be installed at the top of the meter piping to vent gas and fill lines.

In the measurement of water by orifice meter, the water is allowed to fill the connecting lines and the meter and cover the mercury. In oil measurements, the flowing oil should likewise be allowed to fill the connecting lines and the meter, except where the oil is so viscous as to actually interfere with the operation of the meter or where the oil is apt to break up the mercury into small particles. This sometimes happens in pulsating oil flow, with oil on top of the mercury. We believe that seals should be avoided where possible, so as to have only one liquid in the system besides the mercury. This eliminates the difficulty of losing the sealing liquid and having different levels of the sealing fluid and simplifies coefficient calculations. In the case of practically all petroleum products of a gravity of 20 degrees A.P.I. or more, the flowing oil should be allowed to fill the meter lines and meter. We have several crude oil meter installations where the crude oil is allowed to fill the meter lines and cover the mercury, and these installations regularly check within 2 per cent of tank gauges. These flows are slightly pulsating so that the sluggishness of the oil in the meter lines and meter does not interfere with the sensitive operation of the meter but rather aids in making a clear chart record. In this practice of allowing the crude oil to fill the meter and meter lines, it is often more convenient to fill the meter with kerosene, which is easier and nicer to handle. The kerosene mixes with the crude oil and the gravity of the material in the meter is soon practically the same as the flowing oil. This method can be used in any oil installation where the kerosene would be more convenient to handle than the flowing liquid. The kerosene readily fills the lines and meter and eliminates air bubbles. Sediment traps are often useful when installed near orifice connections to keep sediment from getting into meter lines or meter. On many crude meter installations and residuum meter installations it is advisable to seal the crude oil or residuum from the mercury. This can be done with water or glycerine. Glycerine has the disadvantage of being more sluggish, but it lasts longer, and is less apt to mix with the oil. When the sealing fluid is used, a reservoir is placed in each of the connecting lines of the meter. These reservoirs or seals are placed as close to the orifice connections as possible, when sluggishness is the reason for the seal and placed as close to the meter as possible when it is desired to keep the mercury and meter free from the dirty oil.



PIPE NOMINAL SIZE	SIZE I.D. OF STD. PIPE	FOR FULL ½ BORED ORIFICE	"B" FOR STD. FLGS.	"B" FOR EXTRA STRONG FLGS.	"C" FROM CENTER
2"	2.07"	1.90"	4½"	4⅝"	1⅝"
2½	2.47	1.879	4⅝	5⅛	1⅞
3	3.07	2.23	5⅛	5¾	1⅞
4	4.03	3.00	6¼	6⅞	2⅛
6	6.07	4.90	8¼	9½	2⅞
8	8.07	6.90	11	11½	3½
10	10.19	7.90	13½	14½	4
12	12.09	9.90	15½	16½	4¾

These seals usually consist of a section of 2-inch, 3-inch or 4-inch standard wrought iron pipe, 4 to 6 inches long, closed at both ends, and ¼-inch or ⅜-inch pipe connections welded on. Some seals are made so that the section of pipe is to be used in a vertical position; one connection then comes out on the bottom or near the bottom and the other connection comes in the top, with a connection near the top for determining sealing liquid level. We use and advocate seals made from a section of 2-inch pipe five inches long, to be used in a horizontal position. One ¼-inch pipe connection is welded near the top on one end and another ¼-inch pipe connection is welded near the bottom on the opposite end. A ¼-inch connection is welded on the top of the seal for filling. These seals give a miximum sealing area of 10 inches and require no ells or tees in their installation. They are merely installed as a section of the pipe.

A bypass should be installed in the meter piping of any oil meter installation, for purposes of checking the meter to zero, similar to most other meter installations. Usually it does not make much difference where it is installed. If installed near the meter, it is usually very convenient, but checks the meter only. If located near the orifice plate it is a check for both the piping and the meter.

In the calculation of orifice constants for oil measurements, we have divided the ordinary orifice coefficients into two parts. This simplifies the deriving of orifice coefficients and makes possible the establishment of tables. One part is called the line constant and depends upon the size of pipe line, the size of orifice, and the quantity in which we wish to have our final answer read. The other part we designate the material constant and it depends upon the material flowing through the orifice and the sealing fluid, if any.

COEFFICIENT CALCULATIONS

Basic flow formula representing theoretical flow through an orifice.

(1.) $Q = AV = A\sqrt{2gH}$

Q=Flow in cubic feet per second.

A=Area of orifice in square feet.

V=Velocity of flow at orifice in feet per second.

G=Acceleration due to gravity in feet per second.

H=Differential pressure in feet of the flowing liquid.

Introducing next the coefficient of velocity or efficiency factor; this factor represents a constant relation for any given orifice in any given line between the actual flow and the theoretical flow, and has been found to be practically the same for air, gas, steam, water, oil and non-viscous liquids. These factors have been found experimentally and are published by the various meter manufacturers.

(2.) $Q = C_vA\sqrt{2gH}$

C_v=Coefficient of velocity or efficiency factor.

In the fundamental formula, H is equal to the differential pressure in feet of the flowing liquid. In the case of an orifice meter, the differential pressure is measured in inches of water, rather than feet of the flowing gas or liquid.

The pressure in pounds per square inch at the base of a column one foot high of any liquid is $\frac{W}{144}$, where W is the weight in pounds of one cubic foot of the fluid. Since one pound per square inch is equal to a pressure of 27.71 inches of water at 60° Fahr., the pressure in inches of water at the base of a column one foot high of any liquid is $\frac{27.71W}{144}$ or $\frac{W}{5.197}$, therefore $H = \frac{5.197}{W}h^1$

(3.) $Q = C_vA\sqrt{2gh^1\frac{5.197}{W}}$

h^1=True differential in inches of water, and this formula gives correct results in measuring air or gas—

Substituting:

$$A = \frac{Pi\ d^2}{144\times4} \text{ and } g = 32.14$$

(4.) $$Q = C_v\frac{.09970\ d^2}{\sqrt{W}}\sqrt{h^1}$$

Where Q=Cubic feet per second of flowing fluid.

To get this to barrels per hour—

(5.) $$Q = C_v\frac{\frac{.09970\times60\times60}{5.61458}}{\sqrt{W}}\sqrt{h^1}$$

When a mercury differential gauge which has been graduated in inches of water for use in measuring air or gas is used for measuring liquids, the mercury is covered by the liquid being measured, or by a sealing liquid, and the differential reading must be multiplied by $1 - \frac{G}{13.58}$ where G represents the specific gravity of the liquid on top of the mercury. This is because all of our meters we buy are calibrated to read inches of water with air or gas in the meter. When there is a liquid in the meter, the differential pressure is less than that shown by the meter.

$$h^1 = 1 - \frac{\text{Sp. Gr.}}{13.58}\, h$$

h^1=True differential pressure. Correct for measuring gas and air.

h=Differential in inches of water as read from the meter.

$$(6.)\quad Q = 63.93\ C_v d^2\ \frac{\sqrt{1 - \frac{\text{Sp. Gr.}}{13.58}}}{\sqrt{W}}\ \sqrt{h}$$

Substituting:—$\sqrt{W} = \sqrt{\text{Sp. Gr.} \times 62.32}$

Our equation for the measurement of oil becomes:

$$(7.)\quad Q = 63.93\ C_v d^2\ \frac{\sqrt{1 - \frac{\text{Sp. Gr. (a)}}{13.58}}}{\sqrt{\text{Sp. Gr. (b)} \times 62.32}}\ \sqrt{h}$$

Sp. Gr. (a)=Specific Gravity of material on top of mercury, usually the same as the flowing liquid.

Sp. Gr. (b)=Specific Gravity of flowing liquid.

We have separated the terms of the coefficients as follows:

$$\text{Line Constant} = 63.93\ C_v d^2$$

$$\text{Material Constant} = \frac{\sqrt{1 - \frac{\text{Sp. Gr. (a)}}{13.58}}}{\sqrt{\text{Sp. Gr. (b)} \times 62.32}}$$

Tables have been compiled for these two constants.

In the measurement of oil, it is usually desired to know the flowing quantity and rate at some base temperature, rather than the quantity at the flowing temperature. This brings up the need of a set of temperature correction tables to correct orifice constants. This is especially important in refinery work, as a great part of our oil measurement work consists of measuring hot oils. While the measurement of hot oils has the disadvantage of using large temperature correction factors, it has an advantage, as the viscosity of the oil at the high temperatures can be ignored since it is approximately the same as water.

TEMPERATURE CORRECTION CALCULATION

Base formula for temperature correction:

$$(8.)\quad \text{Vol. of oil at } 60°\text{F} = \frac{\text{Vol. at T° F}}{1 + (\text{T}° - 60°) \times \text{Ce}}\ \left\}\ \begin{matrix}\text{for oil}\\ \text{above}\\ 60°\text{F}\end{matrix}\right.$$

$$(9.)\quad \text{Vol. of oil at } 60°\text{F} = \frac{\text{Vol. at T°F}}{1 - (60° - \text{T}°) \times \text{Ce}}\ \left\}\ \begin{matrix}\text{for oil}\\ \text{below}\\ 60°\text{F}\end{matrix}\right.$$

T° = Temperature of flowing oil.

Ce = Coefficient of expansion of oil.

$$\text{Material constant for oil flow} = \frac{\sqrt{1 - \frac{\text{Sp. Gr. (a)}}{13.58}}}{\sqrt{\text{Sp. Gr. (b)} \times 62.32}}$$

Sp. Gr. (a)=The specific gravity of the material in the meter above the mercury, usually near 60°F, and usually the same material as the flowing oil to be measured. No temperature correction necessary.

Sp. Gr. (b)=The specific gravity of the flowing oil. This specific gravity is reported at 60°F, and if the temperature is other than 60°F a correction is necessary.

Quantity or volume of oil at 60°F if flowing temperature is 60°F:

$$(7.)\quad Q = 63.93\ C_v d^2\ \frac{\sqrt{1 - \frac{\text{Sp. Gr. (a)}}{13.58}}}{\sqrt{\text{Sp. Gr. (b)} \times 62.32}}\ \sqrt{h}$$

If the flowing temperature is T°F (Some temperature above 60°F).

$$(10.)\quad Q \text{ at T°} = 63.93\ C_v d^2\ \frac{\sqrt{1 - \frac{\text{Sp. Gr. (a)}}{13.58}}}{\sqrt{\text{Sp.Gr.(b)} \times 62.32 \times N}}\ \sqrt{h}$$

$$N = \frac{1}{1 + (\text{T}° - 60°\text{F}) \times \text{Ce}}$$

Where Ce=Coefficient of expansion of the oil.

$$(11.)\quad Q \text{ at T°} = \text{Line Cons.} \times \text{Mat. Cons.} \times \sqrt{1 + (\text{T}° - 60°) \times \text{Ce}}$$

(8.) Vol. correction formula

$$\text{Vol. at } 60°\text{F} = \frac{\text{Vol. at T°}}{1 + (\text{T}° - 60°) \times \text{Ce}}$$

TABLE 1-A

LINE CONSTANTS FOR CALCULATING ORIFICE COEFFICIENTS FOR OIL MEASUREMENTS

Line Constant in B.P.H.=63.93 Ed^2 E=Efficiency factors from Foxboro for self contained or flange connections.

Diam. of Orifice	Orifice Squared	Multiplied by 63.93	2" Pipe		3" Pipe		4" Pipe		6" Pipe	
			Eff.	Orif. Cons.	Eff.	Orif. Cons.	Eff.	Orif. Cons.	Eff.	Orif. Cons.
1/4	0.0625	4.00	.606	2.424	.606	2.424	.606	2.424		
3/8	0.1406	8.99	.606	5.448	.606	5.448	.606	5.448		
1/2	0.2500	15.98	.606	9.684	.606	9.684	.606	9.684	.606	9.684
5/8	0.3906	24.97	.606	15.132	.606	15.132	.606	15.132		
3/4	0.5625	35.96	.606	21.792	.606	21.792	.606	21.792	.606	21.792
7/8	0.7656	48.94	.607	29.707	.606	29.658	.606	29.658		
1	1.0000	63.93	.616	39.31	.606	38.742	.606	38.742	.606	38.742
1 1/8	1.2656	80.91	.635	51.378	.606	49.031	.606	49.031		
1 1/4	1.5625	99.89	.654	66.327	.606	60.533	.606	60.533	.606	60.533
1 3/8	1.8906	120.87	.703	84.972	.609	73.610	.606	73.247		
1 1/2	2.2500	143.84	.750	107.880	.616	88.605	.606	87.167	.606	87.167
1 5/8	2.6406	168.81			.628	106.013	.606	102.299		
1 3/4	3.0625	195.79			.644	126.089	.607	118.845	.606	118.649
1 7/8	3.5156	224.75			.664	149.234	.610	137.098		
2	4.0000	255.72			.689	176.191	.616	157.524	.606	154.966
2 1/8	4.5160	288.71			.718	207.294	.625	180.444		
2 1/4	5.0625	323.65			.750	242.738	.635	205.518	.606	196.132
2 3/8	5.6406	360.60					.648	233.669		
2 1/2	6.2500	399.56					.664	265.308	.606	242.133
2 5/8	6.8906	440.52					.682	300.435		
2 3/4	7.5625	483.47					.703	339.879	.609	294.433
2 7/8	8.2656	528.42					.720	380.462		
3	9.0000	575.37					.750	431.53	.616	354.428
3 1/4	10.5625	675.26							.628	424.063
3 1/2	12.2500	783.14							.644	504.342
3 3/4	14.0625	899.02							.664	596.949
4	16.0000	1022.88							.689	704.764
4 1/4	18.0625	1154.74							.715	825.639
4 1/2	20.2500	1294.58							.750	970.935

Diam. of Orifice	Orifice Squared	Multiplied by 63.93	8" Pipe		10" Pipe		12" Pipe	
			Eff.	Orif. Cons.	Eff.	Orif. Cons.	Eff.	Orif. Cons.
1/2	0.2500	15.98	.606	9.684	.606	9.684	.606	9.684
3/4	0.5625	35.96	.606	21.792	.606	21.792	.606	21.792
1	1.000	63.93	.606	38.742	.606	38.742	.606	38.742
1 1/4	1.5625	99.89	.606	60.533	.606	60.533	.606	60.533
1 1/2	2.2500	143.84	.606	87.167	.606	87.167	.606	87.167
1 3/4	3.0625	195.79	.606	118.649	.606	118.649	.606	118.649
2	4.000	255.72	.606	154.966	.606	154.966	.606	154.966
2 1/4	5.0625	323.65	.606	196.132	.606	196.132	.606	196.132
2 1/2	6.2500	399.56	.606	242.133	.606	242.133	.606	242.133
2 3/4	7.5625	483.47	.606	292.983	.606	292.983	.606	292.983
3	9.0000	575.37	.606	348.674	.606	348.674	.606	348.674
3 1/4	10.5625	675.26	.606	409.208	.606	409.208	.606	409.208
3 1/2	12.2500	783.14	.607	475.366	.606	474.583	.606	474.583
3 3/4	14.0625	899.02	.610	548.402	.606	543.907	.606	543.907
4	16.0000	1022.88	.616	630.094	.606	619.865	.606	619.865
4 1/4	18.0625	1154.74	.625	721.71	.606	699.772	.606	699.772
4 1/2	20.2500	1294.58	.635	822.058	.608	787.269	.606	784.679
4 3/4	22.5625	1442.42	.648	934.688	.611	881.319	.606	8741.065
5	25.0000	1598.25	.664	1061.238	.616	984.522	.606	9685.395
5 1/4	27.5625	1762.07	.682	1201.732	.622	1096.008	.607	1069.576
5 1/2	30.2500	1933.88	.703	1359.518	.631	1220.278	.609	1177.733
5 3/4	33.0625	2113.69	.720	1521.875	.640	1352.762	.611	1291.465
6	36.0000	2301.48	.750	1726.110	.651	1498.263	.616	1417.712
6 1/4	39.0625	2497.27			.664	1658.187	.621	1550.805
6 1/2	42.2500	2701.04			.678	1831.305	.627	1693.552
6 3/4	45.5625	2912.81			.694	2021.490	.635	1849.634
7	49.0000	3132.57			.711	2227.257	.643	2014.114
7 1/4	52.5625	3360.32			.730	2453.034	.653	2194.289
7 1/2	56.2500	3596.06			.750	2697.045	.664	2387.784
7 3/4	60.0625	3839.80					.675	2591.865
8	64.0000	4091.52					.688	2814.966
8 1/4	68.0625	4351.24					.696	3028.463
8 1/2	72.2500	4618.94					.717	3311.780
8 3/4	76.5625	4894.64					.733	3587.771
9	81.0000	5718.33					.750	4288.748

With a flowing temperature of T° F the volume at 60°F is equal to:

$$Q = \text{Line cons.} \times \text{mat. cons.} \times \frac{\sqrt{1+(T°-60°)\times Ce}}{1+(T°-60°)\times Ce}\sqrt{h}$$

The temperature correction to correct an orifice coefficient for the measurement of hot oil:

$$\text{Temp. corr. factor} = \sqrt{\frac{1}{1+(T°-60°F)\times Ce}}$$

TABLE OF MATERIAL CONSTANTS FOR CALCULATING ORIFICE COEFFICIENTS FOR OIL MEASUREMENTS

$$\text{Material Constant} = \frac{\sqrt{1-\frac{\text{Sp. Gr.}}{13.58}}}{\sqrt{\text{Sp. Gr.} \times 62.32}}$$

These factors to be used when the liquid on top of the mercury is the same as the flowing liquid.

°A.P.I. 60°F.	Spec. Grav.	Material Constant
10	1.0000	0.1219
11	.9930	0.1223
12	.9861	0.1228
13	.9792	0.1233
14	.9725	0 1237
15	.9659	0.1242
16	.9593	0.1247
17	.9529	0.1251
18	.9465	0.1256
19	.9402	0.1261
20	.9340	0.1265
21	.9279	0 1270
22	.9218	0.1274
23	.9159	0.1278
24	.9100	0.1283
25	.9042	0.1286
26	.8984	0.1292
27	.8927	0.1296
28	.8871	0.1299
29	.8816	0.1305
30	.8762	0.1309
31	.8708	0.1313
32	.8654	0.1318
33	.8602	0.1322
34	.8550	0.1326
35	.8498	0.1330
36	.8448	0.1334
37	.8398	0.1340
38	.8348	0.1344
39	.8299	0.1348
40	.8251	0.1352
41	.8203	0.1356
42	.8156	0.1360
43	.8109	0.1364
44	.8063	0.1368
45	.8017	0.1372
46	.7972	0.1376
47	.7927	0.1380
48	.7883	0.1385
49	.7839	0.1389
50	.7796	0.1393
51	.7753	0.1397
52	.7711	0.1401
53	.7669	0.1406
54	.7629	0.1410
55	.7587	0.1412
56	.7547	0.1417
57	.7507	0.1421
58	.7467	0.1425
59	.7428	0.1430
60	.7389	0.1432
61	.7351	0.1437
62	.7313	0.1441
63	.7275	0.1446
64	.7238	0.1448
65	.7201	0.1453
66	.7165	0.1457
67	.7128	0.1462
68	.7093	0.1464
69	.7057	0.1469
70	.7022	0.1473
71	.6988	0.1476
72	.6953	0.1480
73	.6919	0 1483
74	.6886	0.1487
75	.6852	0.1492

TEMPERATURE CORRECTION FACTOR FOR CORRECTING ORIFICE COEFFICIENTS FOR OIL MEASUREMENT

$$\text{Formula:—Temp. corr. factor} = \sqrt{\frac{1}{1+(T°-60°\times \text{coef. of expan.}}}$$

Degrees Fah't	For Petroleum Oils up to 34.9° A.P.I. Coef. of Expan. .0004	For Petroleum Oils 35° A. P. I. to 50.9° Coef. of Expan. .0005	For Petroleum Oils 51° A. P. I. to 78.9° Coef. of Expan. .00065
40	1.00402	1.00504	1.00657
50	1.00201	1.00251	1.03418
60	0.00000	0.00000	0.00000
70	0.99801	0 99751	0.99677
80	0.99602	0.99504	0.99356
90	0.99405	0.99258	0 99037
100	0.99205	0.98971	0.98726
110	0.99015	0.98773	0.98403
120	0.98821	0.98533	0 98106
130	0.98629	0.98295	0.97800
140	0.98437	0.98058	0.97498
150	0.98247	0.97823	0.97198
160	0.98058	0.97590	0.96975
170	0.97870	0.97358	0.96606
180	0.97683	0.97129	0.96315
190	0.97497	0.96900	0.96026
200	0.97312	0.96674	0.95740
210	0.97129	0.96449	0.95454
220	0.96946	0.96225	0.95174
230	0.96764	0.96003	0.94895
240	0.96583	0.95783	0.94618
250	0.96404	0.95564	0 94344
260	0.96225	0.95346	0.94072
270	0.96047	0.95130	0.93802
280	0.95871	0.94916	0.93536
290	0.95695	0.94703	0.93217
300	0.95520	0.94491	0.93009
310	0.95346	0.94281	0.92748
320	0.95173	0.94072	0.92490
330	0.95001	0.93865	0.92334
340	0.94830	0.93659	0.91980
350	0.94660	0.93454	0.91728
360	0.94491	0.93250	0.91478
370	0.94323	0.93048	0.91230
380	0.94155	0.92848	0.90984
390	0.93989	0.92648	0.90701
400	0.93823	0.92450	0.90499
410	0.93658	0.91862	0.90258
420	0.93495	0.92057	0.89920
430	0.93332	0.91863	0.89784
440	0.93169	0.91670	0.89550
450	0.93008	0.91478	0.89318
460	0.92848	0.91287	0.89087
470	0.92688	0.91098	0.88858
480	0.92529	0.90909	0.88631
490	0.92371	0.90722	0.88406
500	0.92214	0.90536	0.88182
510	0.92057	0 90351	0.87960
520	0.91902	0.90167	0.87739
530	0.91714	0.89984	0.87521
540	0.91593	0.89803	0.87303
550	0.91440	0.89622	0.87088
560	0 91287	0.89443	0.86874

Coefficient of expansion tables are to be found in Bureau of Standards circular No. 154 and in a supplement to circular No. 154. This supplement has been prepared to meet the practical demands of the oil industry for a short convenient table for reducing oil volumes to the basis of 60° Fahr. This table is sufficiently accurate for everything but scientific work and should be used in our oil measurements. This supplement groups the various petroleum products according to their gravities for which the same coefficient of expansion can be used. The six groups are as follows:

Group No.	Coefficient of Expansion	Range of Groups Degrees A.P.I. at 60°F
1	.0004	up to 34.9
2	.0005	35 to 50.9
3	.0006	51 to 63.9
4	.0007	64 to 78.9
5	.0008	79 to 88.9
6	.00085	89 and higher

It has been necessary for the oil industry to do much for itself in the development of the orifice meter as an oil measuring device, as practically nothing was published when this work was started. I believe much progress has been made.

Orifice meters are now used in oil refineries to measure and balance the loads to stills and to indicate when a still needs cleaning. They serve well the need of distributing the crude oil coming into a refinery so as to receive maximum heat exchanger efficiency. The orifice meter is a very useful instrument in the control of fractionating columns by the measurement of vapors and reflux to the column. It serves a useful place in the measurement of absorption oil at absorption plants and can be used as an indicator of steady operation in any continuous plant. Extreme accuracy has so far not been needed. In fact, many charts that are made are not even figured. The meters are well serviced and cared for, but the approximate rate is the reason for their installation. But as this work progresses, there will arise needs for greater accuracy in oil measurement by orifice meter. I believe viscosity multipliers should be checked and that coefficients of velocity for oil should be checked and some standardization of orifice connections should be adopted. I hope that work will continue along this line and that an organization such as ours can accomplish some of this work.

STARTS GASOLINE UNIT

A new gasoline absorption plant has been put into operation by the Natural Gas & Fuel Corporation, of El Dorado, Ark., at the town of Magenta, six miles from Monroe, La. Gas from the Richland and Monroe fields is being run through this plant before it is turned into the 10-inch Continental Supply Company line, which takes it into El Dorado. The plant, costing $100,000, handles an average of 20,000,000 feet of gas per day, extracting 8,000 gallons. George T. Koch is in charge of the plant.

As announced by Leon O. Whitsell, president of the California Railroad Commission, that body in 1927 authorized the issuance of nearly $100,000,000 more in public utility securities than during any other year of its existence.

APPLY TO PIPE GAS INTO NEW ORLEANS

The city of New Orleans has received application from an un-named concern for a franchise to pipe natural gas into the city for domestic and industrial use. The application was filed in the name of the recorder of mortgages for the city, who did not disclose the names of his principals.

GAS ON IN TRACY, FEB. 1

Gas was expected to be turned into the Tracy, Calif., mains from the Tracy Gas Company's new plant, by February 1, according to E. A. Stowe, the company's resident manager. Mr. Stowe came to Tracy recently from his former position of resident manager for the Oceanside, Calif., Gas Company.

THREE COMPANIES BID TO BRING GAS TO OMAHA

Three companies have submitted bids to bring natural gas to Omaha, Neb., to the municipal utilities department of that city, it was reported in January. The bidders are the Texas Columbia Carbon Company, the Skelly Oil Company and the Knorpf interests.

Later press reports state that all proposals have been rejected by the directors of the Omaha metropolitan utilities district, to allow time for further study of the matter.

NEW COMMISSION HEAD

Following the custom of rotating the presidency of the California Railroad Commission, Leon O. Whitsell has succeeded Ezra W. Decoto as president of that body for the year 1928.

MOVES ASSOCIATION OFFICES

The Texas division of the Mid-Continent Oil & Gas Association has moved its offices to Suite 1328, Kirby Building, Dallas.

METTLER FOLDER

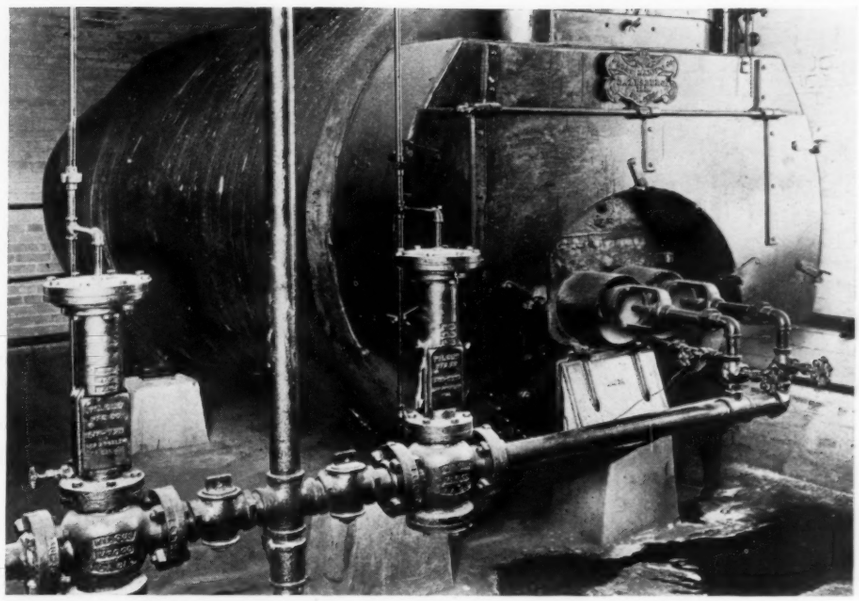
Lee B. Mettler Company, Los Angeles, Calif., has issued a folder descriptive of the Mettler entrained combustion gas burners, which may be had by request of the manufacturer.

SHAPE PLANS FOR MEETING OF OKLAHOMA GROUP

Preliminary arrangements are being made for the 10th annual convention of the Oklahoma Utilities Association to be held at the Mayo Hotel, Tulsa, March 13, 14 and 15. Several committees have already been appointed by E. R. Ernsberger, president of the Association and president and general manager of the Southwestern Light and Power Company. The convention committee, which will have general supervision over all convention arrangements is: E. F. McKay, chairman; O. D. Hall, L. P. Arnold and R. S. McBeth, vice-chairmen; F. F. Clark, H. L. Montgomery, L. H. Clegg, W. S. Pedley, H. B. Cobban, C. W. Robbins, R. W. Curran, L. W. Scherer, George Ade Davis, E. B. Smith, F. P. Finney, T. H. Steffens, F. B. Hathaway, B. P. Stockwell, Charles Hoopes, J. A. Whitlow, H. W. Hubenthal, F. A. Whartenby, Fred Karr, R. W. McClure, W. C. McGraw, M. L. Margenau and R. V. Miller.

The personnel of the exhibits committee is O. D. Hall, chairman; F. T. Ealand, Sam B. Hardin, F. B. Hathaway, E. I. Jones, A. F. Keller, A. J. Kerr, L. J. Locke, W. C. McGraw, A. D. Peabody, A. Thrasher, J. W. Walton and J. E. Wilkins.

A meeting of the convention and the exhibits committees was held on January 19, and space on the fifteenth floor of the Mayo Hotel was engaged for exhibits.



30 B. H. P. boiler equipped with high pressure burners and automatic steam pressure regulator

Gas *for* Tight Boilers

(Continued from Page 27)

each when operating on approximately two pounds gas pressure. The burners should be placed in such a manner that the auxiliary oil burner is properly located and that the air which is drawn through the gas burner tube is below the oil burner when it is in operation. The reason for this is that the incoming air will be under the atomized oil and hold it in suspension until the oil is volatilized and burned. If there is one burner it should be placed so that the center is about eight inches above the brick lining of the internal drum and inclined down at a 10-degree angle. In case of two burners they should be placed side by side and as above described.

Brick work in the internal drum of a Scotch boiler has received insufficient attention. The use of brick in this type of boiler is only to accelerate combustion by quickly raising the temperature of the fuel and to protect the drum from the hot spot produced at the point where most of the combustibles ignite. Bricking up the entire circumference for a distance of three feet from the front end should be sufficient. When a dutch oven is used no brick is necessary in the boiler.

Due to the defined size of the combustion space in a Scotch boiler, a place for admitting more secondary air on high loads should be provided. This can be done by arranging a small door under the burners that will have an adjustable opening, or by leaving one or two loose bricks, that may be removed, under the burners.

The views and drawing show this arrangement very well. The illustrations are taken from a typical gas-fired job working satisfactorily on a fluctuating load which has some very high demand points.

Some stationary engineers line the lower half of a Scotch boiler the entire length of the internal drum to protect the bottom from flame impingement. This is not necessary if the burners are properly located and produce a short flame. The water circulation is naturally up so that the bottom of the internal drum has cool water against it, because any steam formed there quickly rises along the sides and cool water takes its place.

The information in this article has been accumulated through the installation of many of these boilers and is based upon satisfactory plants now in operation, but, naturally, it may be subject to modification under different conditions.

SALES MESSAGE IS GIVEN AT APPLIANCE SOCIETY BANQUET

CREATIVE selling versus order taking was the subject of the main address delivered by John F. Gorman before the Gas Appliance Society of California in its annual convention banquet held in the Clift Hotel, San Francisco, on Wednesday, January 25. The subject of the discourse was timely, coming as it does at the moment when the entire northern and central part of the state of California has suddenly been reawakened to interest in merchandising activity and creative selling by the new campaign of the Pacific Gas and Electric Company.

The meeting was one of the evening features of Furniture Market Week, and in attendance were furniture and appliance dealers from the entire state, representatives of the gas companies and distributors of various manufacturers' products.

R. E. Danforth, vice-president of the organization, presided in the absence of President O. C. Bunster. Frank Runyon, president of the state furniture dealers association, was also on the speakers' platform.

Forrest U. Naylor, manager of Gas Sales of the P. G. and E., as well as secretary and campaign director of the Gas Appliance Society, outlined in some detail the project activities for the year. The major efforts are to be: the Spring Campaign; the Summer Automatic Water Heater Campaign; the Canning and Preserving Seasonal Campaign; and the House Heating Campaign.

Opening ceremony at the new Santa Barbara, Calif., district office of the Southern Counties Gas Company. Left to right, the men are: Mayor of Santa Barbara, T. R. Finley; LeRoy M. Edwards; George W. Smith; Wayne W. Fitkin; Frank H. Bivens; Chas. H. Dickey; F. S. Wade

The Gas Office Keeps Step

(Continued from Page 31)

predominating tone of walls, instead of the usual hospital white, with the baseboard a rich black enamel to emphasize the delicate wall coloring. The arch into which the sink, cupboard, and range are placed is another attractive feature. A light has been located over the range, and another over the sink and cupboard.

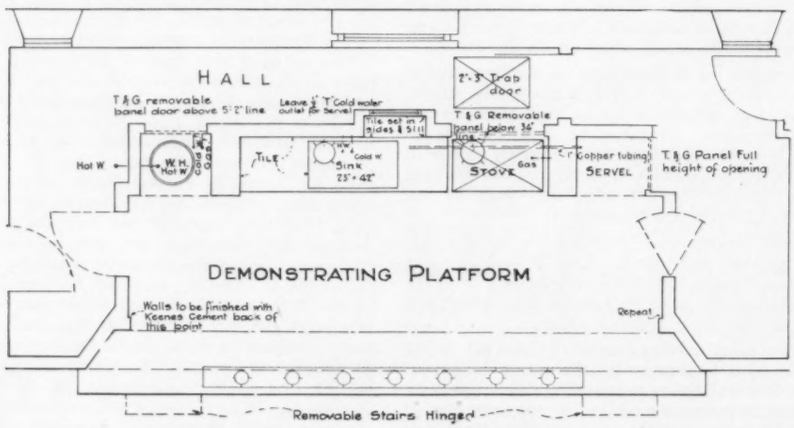
High grade linoleum has been used to cover the floor, this choice being dictated by the inexpensiveness of linoleum—an appeal to the woman of limited means—and the ease with which it can be kept clean. On the advice of local housewives the linoleum was used in preference to hardwood flooring.

A new style sink, with dish pan formed at one end and the regular sink space at the other, has been used, and the faucet is one-piece.

To aid in the work of demonstration a passageway extends behind and on both sides of the model kitchen, so that the workers need not cross the platform in front of the audience, and materials for use in the demonstration may be kept on both sides of the stage in cupboards and on shelves provided for that purpose.

The outside stairway connecting with the demonstration room has already been mentioned, and permits independent access to the lectures, teas, and other functions when this is desired. Rest rooms are located on either side of the demonstration room at the north end.

It is worthy of note that the gas company got the full measure of credit for its accomplishment in the design and completion of its Santa Barbara office. The stage was well set: Both of the city's leading daily newspapers put out special editions for the company, and editorial comment was highly commendatory. One edition in particular, that of the Santa Barbara Morning Press for January 9, the day of the gas office opening, was a real contribution to gas publicity. The company's publicity department was instrumental in preparing this eight-page special.



Floor plan of model kitchen at Santa Barbara. Scale: ½"=1' 0"

On the evening of the building's opening the company was host at a Spanish dinner served in the demonstration room, to 70 "key" men—including city and county functionaries, gas company officials, bank presidents, heads of service clubs and business associations, newspaper publishers and editors. Five hundred ladies of the community—women from all classes—were entertained at tea in a three-hour period on the afternoon of the day following.

All in all, the gas company is to be congratulated very heartily upon its success in localizing itself in Santa Barbara by this master stroke. It might have built a mere gas office, but instead it caught the sense of its community, "kept in step" and made a lasting gesture that will earn it good will for years to come. Deserved credit goes to Geo. W. Smith, Santa Barbara district manager, and to all co-operating company departments for the consummation of the project.

OHIO ASSOCIATION NOW IS AFFILIATED WITH A. G. A.

Announcement that the Ohio Gas and Oil Men's Association has affiliated with the American Gas Association, was made from A. G. A. headquarters in January. The Ohio Association was established on June 10, 1918, and now has a total membership of 1700. It is the sixteenth group to be added to the role of affiliated A. G. A. associations. John J. McMahon, of the East Ohio Gas Company, Cleveland, Ohio, is president of the Ohio association, and Wm. H. Thompson, Columbus, Ohio, is secretary-treasurer. The official address of the Association is that of the secretary-treasurer.

ADD TO GILMORE PLANT

The Gilmore Gasoline Company has let a contract to J. A Campbell for the building of a 15,000-gallon unit to their absorption plant, No. 2, at Long Beach, California. Campbell equipment is to be used, and the unit will be ready for operating about February 20.

LONE STAR CONSTRUCTION TO COST $1,500,000

Lone Star Gas Company is reported to be spending about $1,500,000 in Stephens and Grady counties, Oklahoma, the main item of construction being a 40-mile 16-inch line from Grady county to Pernell in Garvin county to make connection with the company's main line to Dallas.

$2,000,000 STOCK ISSUE

San Diego Consolidated Gas and Electric Company has been authorized by the California Railroad Commission to sell on or before December 31, 1928, at not less than par $2,000,000 of common capital stock.

Giant Empire Gas Line Goes *on* Duty

(Continued from Page 29)

paring orders and specifications for 120,000,000 pounds—60,000 tons—of pipe, costing over $5,000,000; 35,000 20-inch couplings; 2,000 tons of coal tar enamel; 15,000 gallons of coupling paint; the largest order ever given by one company at one time for compressor equipment—a total rated capacity of 13,000 horsepower; the routing of these and other supplies in such a manner that the work would not be delayed, and a multitude of other problems, were next in order.

The capacity of several of the largest pipe mills in the country was necessary to make the deliveries required on this job, and transportation of these materials taxed facilities to the limit. Every available type of long-distance transportation was used—rail, barge-line down the Ohio to the Mississippi, and then to Memphis, and then by rail to Texas—and hundreds of trucks were employed to transport the pipe and other equipment, and place it in position along the 250-mile route of the line.

The terrain of the route varies from bleak prairie to miniature mountain formations, gulches and canyons, and a wide range of soil condition is met.

Seven rivers are crossed enroute to Wichita, where connection is made with the Cities Service distribution system. Four-line crossings were made on the South Canadian, North Canadian, Cimarron, and Salt Fork Rivers; three line crossings on the Medicine Lodge, Chickaskia, and Ninnescah. Multiple lines were laid not only across river beds, but across the probable flood areas on either side of the beds.

Three compressor stations have been erected on the route of the main project from the Panhandle to Wichita and a fourth has been constructed near Ottawa, Kansas. The main line compressor stations were erected at Pampa, Texas, Moreland, Oklahoma, and Wichita, Kansas. The compressor units are of the twin tandem double-acting type, constructed by C. & G. Cooper Company of Mount Vernon, Ohio. Their total capacity is 13,000 horsepower.

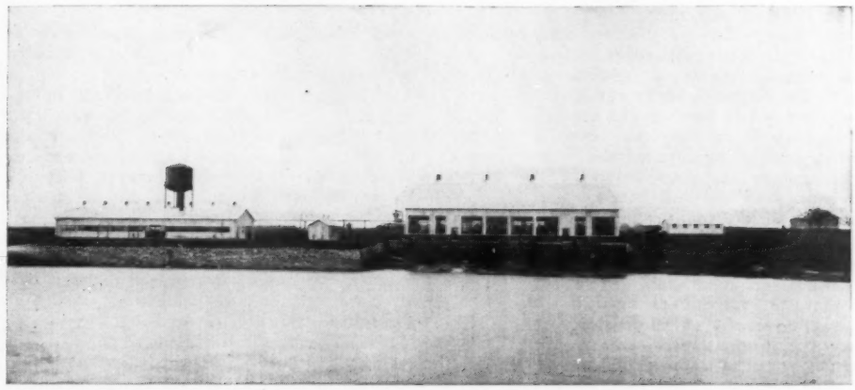
A complete telephone line was built to facilitate the construction work, and to operate the pipeline on completion.

Actual construction operations, on the scale required for this large task, called for a high degree of efficiency in the handling of men and materials. One important preliminary was the erection of camps for the nine construction gangs, which included six main line gangs and three river crossings gangs, each averaging about 150 men.

Each gang was divided as follows: The commissary; the unloading crew; the pipe-stringing crew; the paint, coupling and bolt stringing crew; the welding crew; the painting crew; the ditching gang; pipe laying crew; and the back filling crew.

Upon receipt of a shipment of material, "the material man" representing the gas company, checked the load, notified the unloading crew foreman, who, with his crew of men, unloaded the car. On an average, two small cars of pipe could be unloaded an hour by the use of gin pole, cables and blocks. Paint, bolts, coupling, and other smaller materials were unloaded by the "strong arm" method.

It was then the job of the pipe stringing crew to load the trucks and haul the pipe to the job, where they were guided by two "spotters," who placed the pipe along the right-of-way in its proper position.



Ottawa, Kansas, compressor station on Cities Service system. For interior view of this plant see Page 29

The paint stringing gang followed with the paint couplings and bolts, placing these supplies at proper intervals.

The welding crew was first on the actual work as soon as sufficient quantity of pipe had been strung, welding joints in sections of two or three, according to the topography of the territory traversed. The welding gang usually had 16 welders and 8 helpers.

Next came the painting gang, whose job it was to cover the pipe thoroughly with a water proof tar enamel to prevent corrosion and other detrimental chemical action affecting the pipe. In many places the pipe was wrapped with a coating of asbestos fiber, where soil analysis showed an extra high corrosive action, and similar protection was incorporated at the several larger river crossings.

The ditching crew consisted of one foreman, two machine operators, two oilers, a linesman and four graders. After the pipe was welded into 40 or 50-foot sections and painted, the ditch was dug.. The ditching machine used in this work was driven by a 60-horsepower motor, and in loose, sandy soil was capable of digging a trench seven feet deep, two feet wide and seven feet long in one minute, or the equivalent to moving 19,600 cu. ft. per hour from a ditch.

After the ditch was dug the pipe laying crew, which was composed of about forty men, placed sections of the pipe on skids, rolled them over the ditch and put coupling followers on either end of each section. The back-filling machine, equipped with a large crane, picked up a section and "stabbed" it into the coupling center ring of the joint behind. Sections were then blocked in line over the ditch and joints coupled in lengths of about 1,000 feet at a time. The machine was then taken to where the first coupling was made and the process of gradually lowering the pipe into the ditch began. This process was repeated as each 1,000-foot length was lowered and the machine was again employed in the "stabbing" process.

The back filling was the final operation and completed the laying of the line. Whenever possible tractors were used, two of which were equipped with "Bull-dozers" attached to the front of the tractor. The third was equipped with sidewinch and cable, from which a mormon board could be operated. The first two tractors followed the pipe laying crew very closely, while the third tractor followed the first two and completely filled the ditch, crowning it about two feet high, so that it would be practically level with the surrounding territory when it settled.

In the development of natural gas reserves the outstanding feature was the lease of the 66,000-acre Burk Burnett "Four Sixes" Ranch in Carson and Hutchinson Counties, Texas, last summer. Ten wells have been drilled, averaging 30,000,000 cubic feet of gas each; they are spaced approximately two miles apart.

Completion of this large pipeline cannot fail to have a signal and beneficial influence upon industrial development of the communities affected, and its other aspect—the assurance of ample domestic gas supplies on Cities Service lines—is equally important.

LABORATORY APPROVAL FOR COAST PRODUCTS

Among the Pacific Coast manufacturers who have received the American Gas Association Laboratory approval on their products, as included in a list dated December 31, 1927, are James Graham Manufacturing Company, Hammar-Bray Company. Holbrook, Merrill & Stetson, Electrogas Furnace Company, Pacific Gas Appliance Company, Payne Furnace & Supply Company.

EMPLOYEES SHARE PROFITS

Adoption of a plan for making employees partners in the industry has been announced by the Pioneer Paper Company of Los Angeles through its president, Willis G. Hunt. Beginning this year, 10 per cent of the annual profits of the Los Angeles plant will be divided among the nearly 300 employees of the concern.

MOVE PUBLICATION OFFICE OF "WESTERN GAS"

ON the fifteenth of February *Western Gas* will move its publication office from the present address at 626 South Spring Street, to 124 West Fourth Street, Los Angeles.

Increased floor space has been taken at the new location to facilitate the work of publication.

Increasing Peak Load Capacity

(Continued from Page 26)

more than offset by the investment saving. Forced drafts for all types of furnaces may be used on stacks of insufficient height to give the required boiler rating.

When waste heat boilers are in use, steam for peak loads may be obtained by fuel firing at the expense of the waste heat if the boilers are provided with the proper furnace and shut off between the gas machine and the boiler.

The enlargement of mains, the elimination of fittings, the enlargement of riser and downcomer pipes to scrubbers and such apparatus are all to be considered as a possible means of increasing the capacity of extant exhausters and pushers. Such changes are best considered perhaps, in most cases, if conditions permit, with the installation of added equipment.

The removal of all unnecessary obstacles such as curtains in drips, globe valves etc. may also eliminate pressure drops which appear to be of little consequence at average loads but which increase greatly at the gas flow during peak periods. As an example of this a wash oil separator which proved to be unnecessary was removed from the outlet of the crude light oil scrubbers at the Portland Gas & Coke Company plant. This removal eliminated a 4-inch pressure drop at the present peak requirement.

The drop through direct contact scrubbers, especially with gas of low specific gravity, if such scrubbers are free from tar or napthalene accumulation, is practically nil. Consideration should be given to ample sized riser and downcomer pipes with as little pressure drop as possible occasioned by short bends and fittings.

A study of the existing purifiers' operation may reveal some means of increasing their capacity at peak load. Such change in operation may involve additional expense in labor, material and apparatus, but with an added peak capacity in the main item of investment, the purifiers themselves. As an example of this the purifiers of the Portland Gas & Coke Company are normally operated by having gas passed through half of them for 24 hours. During this time the other half are revived by having air blown through for the 24-hour period. The maximum capacity of these purifiers with no trace of H_2S at this rate was found to be about 32,000,000 cu. ft. per 24 hours. It has been found that by careful watching they may be revived in a 12-hour period after being in use 36 hours, with a somewhat decreased gas flow per purifier. The net result is that this same number of purifiers with three-fourths of the boxes on instead of one-half the number, will purify 38,000,000 cu. ft. per day and the pressure drop will also be less.

The installation of liquid purification may do much toward the cheapening of peak load construction. In localities where the Seaboard process may be used, or the plant equipment is suitable for the disposal of the H_2S gas by burning, there is little doubt of such economy. In localities where the marketing of by-product sulphur may be profitable there is also much probability of the cheapening of plant operation at peak by liquid purification with sulphur recovery. Like all other problems much is dependent upon the size and type of gas plant and local conditions.

The installation of boosters at holder stations to raise the pressure on low pressure mains to a higher pressure than may be obtained through a holder and governor will work in two ways to increase the capacity of a system for peaks: (a) Increased average pressure by use of the booster will increase the main capacity. (b) Such installation will also allow the utilization of the total holder capacity to the last lift. This may also be accomplished with a waterless holder. With pistons of the proper weight most any desired maximum low pressure may be obtained. The thing to be evaluated here would be the additional cost of putting the gas constantly against such a piston weight compared to the cost of lighter piston with booster installation.

At high pressure compressor stations there is a possibility of increasing compressor cylinder sizes rather than purchasing new machines with the added foundation housing and piping charges. Inasmuch as the peak period may be of short duration and occur but once in a period of years and also because at such peak time the cool atmosphere is conducive to ideal conditions for electric motor overload, cylinder and gas cooling, compressors in some cases may be given considerably increased capacity. Compressors also may be speeded up at such times by simple changes in pulley sizes etc. At the normal loads the pressure required on the mains will be less at the decreased gas volume and the efficiency as well as capacity may be increased without overloading the drive unit when warmer weather conditions prevail.

The elimination of gas leakage throughout the system also acts to cut down plant capacity requirement and requirements in all parts of the transmission and distribution system effected. The total system leakage at peak will undoubtedly be more than at normal sendout times due to the greater average pressures carried over the entire system. The larger the volumetric capacity of the system for a given sendout per unit of time the greater should be the effect of a leakage elimination campaign. The judicial expenditure of money each year has been found to be well warranted by several companies to the extent of a considerable decrease in requirement for peak construction and operation and a goodly balance on the right side of the ledger covering this item.

The use of propane and butane, obtained mostly in the absorption process of casing-head gasoline recovery, has been proposed as possible constituents to be mixed with other city gas. Their high specific gravities is the greatest drawback to their use; however, their cheapness may offset this in certain localities and with adequate distribution systems a certain proportion mixed with manufactured or natural gas may be advantageous. A mixture of these gases stored as liquids under pressure will supply from 6.5 to 8.6 cu. ft. per lb. of gas when released to near atmospheric pressure at normal temperatures, giving a gas with a gross heating value of 2400 to 3100 B.t.u. with a specific gravity ranging from 1.5 to 2.0.

In extreme emergencies to take care of the very extreme peaks which may occur it might be policy to shut off certain gas users. Some industrial gas users might well be compensated for such discontinued use in the original rate schedule. When it is considered that extreme peaks occur but once on an average in a number of years the advisability of invested capital to cover occurrences of short peaks at long intervals is problematical. It is sometimes possible to negotiate with the users of natural gas in large quantities, such as oil companies operating crude oil refineries on a large scale, so that arrangements may be made with such user that he discontinue the use of natural gas for fuel and substitute other fuel during the period of peak load.

Another means of taking care of extreme peaks is to decrease the pressure in the whole or part of the distribution system. Such procedure would tend to decrease the speed of all gas utilization and in the case of househeating installations make less gas usage on furnaces which would be operating wide open during such extreme periods. Such operation without too drastic pressure cuts with customer complaints as a barometer, or better utilization field supervision, should only be resorted to in case of extreme necessity.

In the distribution system a survey of pressure conditions might reveal higher pressures than necessary being carried on parts of the system at peak load times. Any such reduction would tend to reduce leakage and relieve governor and station loads.

In plants equipped for by-product production it may be profitable to discontinue such production during peak load periods. Any light oil refining operation may be put off until later. A little higher heat or change in time of carbonization in coal gas plants would tend to lower the B.t.u. of the gas so as not to require stripping. Ovens using lean gas for heating might use producer or blue gas at such periods to release all city gas available for distribution. In oil gas plants higher heats and in carbur-

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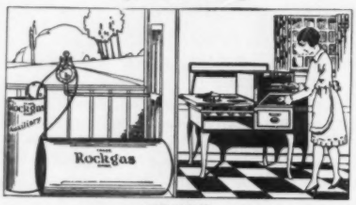

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in places where natural or artificial gas is not available

ROCKGAS will give temporary service in localities where gas mains are to be laid; also permanent service in the event that lines are not anticipated in the locality of installation. It is a form of pure natural gas and comes in convenient sized tanks of various sizes from a tank holding the equivalent of 3,000 cu. ft., 500 b.t.u. gas and 12x37 in. in size to tanks holding the equivalent of 44,040 cu. ft. of 500 b.t.u. gas, of much larger size. Used in thousands of homes, camps, etc.

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etted water gas plants less enriching oil would furnish capacity at a sacrifice of light oil. Shutting down of the oil washers would eliminate some back pressure and increase exhauster capacity. At the plant of the Portland Gas & Coke Company the by-passing of the four oil washers will decrease exhauster pressure 11 inches at the peak requirement. The use of steam and power would also be cut down and equipment need not be provided for these periods. In oil gas plants making carbon briquets steam and power equipment may be conserved to the extent of its use in the drying and briquetting of lampblack. The filter equipment only need be used and the filtered lampblack run to storage. In coal and coke oven plants the coal and coke handling exclusive of the absolutely necessary plant manufacturing needs may be dispensed with; also any steam ammonia stills etc. which would tend to conserve steam demand.

REDUCING INTERRUPTIONS DURING PEAK LOADS

Finally, a study of manufacture and distribution operation and maintenance to reduce interruption during peak loads may mean remarkable savings in labor and equipment during such times. Such planning should preferably be done at off peak periods; however, during each peak occurrence enough data should be gathered to shape the plans to a better advantage for subsequent procedure. During such peaks a survey of all questionable pressure areas in the distribution system should be made with the idea of planning conservatively all necessary additions and also reducing governor and station pressure to a minimum.

The capacity of works piping and equipment may well be tried for the expected coming peak requirement and for actual operating conditions by tests of an hour or so using the works station meter as an indicator. A pressure survey during such test should reveal stoppages or obstructions. A thorough inspection of the distribution system district governors, holder governors, holders with heating systems, high pressure stations, valves, bridge lines, drip etc. should be made. All should be in good operating condition for peak use.

All machinery and equipment at plant should be in good shape and kept so during the peak demand. A systematic scheduling of checker brick, relining and arch work to have machines in the best condition for maximum production, and also in order that arch or other brick work will not fail at the critical time are other valuable precautions.

The emptying and refilling of the purifiers may also be so scheduled that the greatest number of boxes of fresh oxide will be available during the season of peak demand. Where a number of purifiers are used, all but those necessary to carry off the peak load may be filled with fresh charges of oxide and held in readiness. Fresh oxide will have a greater capacity for sulphur before changing as well as giving a less pressure drop in the system.

Trained men who may be required to make up the additional peak load crew may be kept available on other work. By-product or other work which may be dispensed with at peak may furnish the off peak employment. Men to act as foremen or shift foremen should also be a part of the organization on call 365 days of the year.

During the season of expected peaks the gas on hand at that hour of the morning or day when the rate of sendout exceeds the plant capacity should be at a maximum. On peak load days gas should be so distributed in the storage holders at all times that the amount available at the different locations may be utilized to the best advantage. Some gas must be left available for use during the latest hour of the day when the total rate of sendout exceeds the rate of gas make. A method which has been found feasible is to set a low limit for each holder this time of day. The holders may then be filled in the meantime to meet this requirement. These features need careful watching, particularly if no provision has been made to transfer gas from one holder to another, or what amounts to the same thing, from any holder to a belt system connecting all storage holders.

In conclusion it may be stated that savings which may be in normal or base load operations are also very effective in savings at peak, since the base load is a part of the peak load. Because of this peak load and base load must be more or less treated together. New investment in plant and distribution systems may be very largely peak investments.

The pneumatic cushion type of tire reaches its greatest usefulness in the new Goodyear Super Pneumatic Cushion. Made in all sizes from the five-inch to twelve-inch, it brings easy riding and maximum resilience, plus miles of additional wear.

The tread of this tire is very much higher than that of ordinary tires, which, with its durable compound, assures long, economical mileage. In combination with Truck Tire Service it will show a surprisingly low cost per mile.

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GAS PLANT FOR WILLMAR

The city council of Willmar, Minn., has applied for a 25-year franchise to erect and operate a gas plant in that community.

APPLIES FOR RATE INCREASE

The Texas-Louisiana Power Company has made application to the Ranger, Texas, city commission for a permit to increase the domestic gas rate in that city 10c per 1,000 cubic feet. If the raise is granted the rate in effect will be 70c per 1,000 cubic feet.

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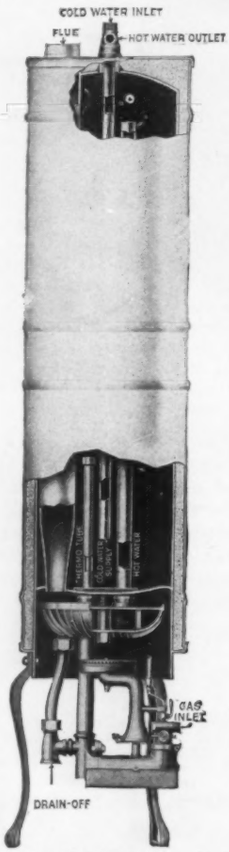

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No. 24—18 gallons..	$ 7.500
No. 32—26 gallons..	85.00
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With Safety Shutoff	150.00
No. 60—52 gallons..	185.00
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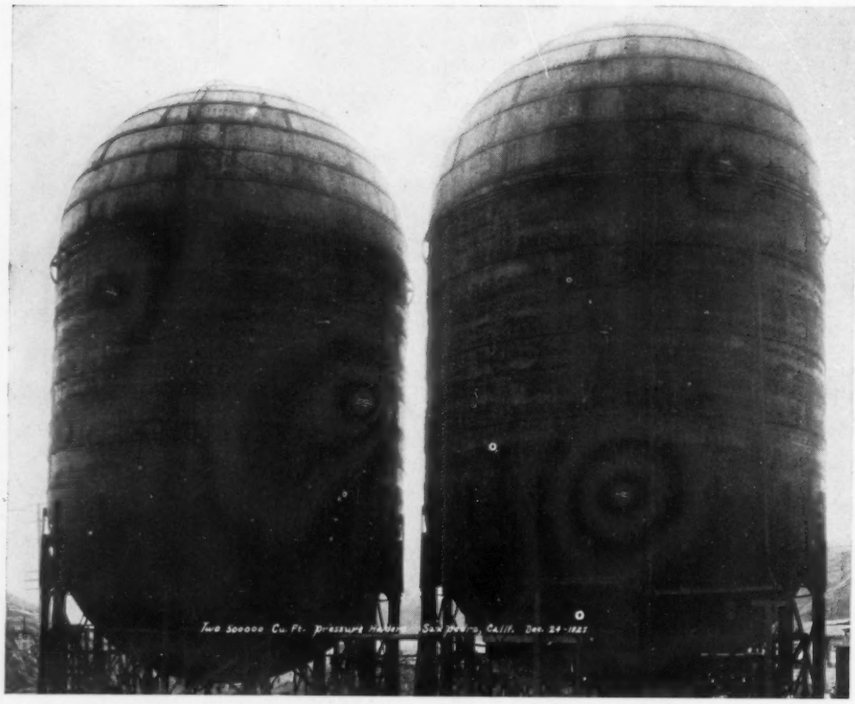

Two vertical cylindrical high pressure holders completed at San Pedro, Calif., in January. Each is of 500,000 cu. ft. capacity

High Pressure Storage Units Built *in* Four Towns

DURING January the Southern Counties Gas Company finished construction work on several additional units of its high pressure storage facilities. Two holders of vertical cylindrical type, each of 500,000 cubic foot capacity, were added at San Pedro, Calif., their combined cost being $117,000. Dimensions of these holders were the same — 54-foot diameter, and 91-foot height. They are built for a maximum working pressure of 50 pounds.

At Anaheim two of the horizontal holders, with hemispherical ends, were constructed, costing together $112,000, each being 500,000 cubic feet in capacity. Their outside diameters are each 26.4 feet, and their overall length 205.9 feet. Their maximum working pressure is 75 pounds.

Two of the horizontal holders, each of 26.4-foot outside diameter, but of different lengths—one being 159.2 feet in length and the other 128 feet—were installed at Monrovia, their combined capacity being 600,000 cubic feet, and their maximum working pressure 65 pounds. Their cost was $68,000.

For Pomona, the company has already let a contract on two high pressure holders, duplicating the San Pedro installation, and these will be complete in about a month. Upon their completion the company will have a total high pressure storage capacity of 5,800,000 cubic feet on its system, with ten holder stations of the pressure type.

Several years ago the company's engineers, A. F. Bridge and M. R. Thompson, designed the horizontal type of high pressure holder which has proved highly successful on Southern Counties lines. The vertical type, such as erected at San Pedro, and illustrated above, is an application of the same principles, and is adapted to use under certain conditions because it requires less ground area for foundation, and because the expansion problem does not arise to the same degree as with the horizontal design.

BUYS TWO GAS PROPERTIES NEAR COFFEYVILLE, KAN.

Paul R. Johnson, president of the Southwestern Gas Company, announces effective January 1 the purchase of the gas properties and pipeline system of the M. T. C. Oil and Gas Company and of the Elbukan Oil Company, south and east of Coffeyville, Kansas. Some fifty gas wells are included in the purchase, as well as the pipline they supply, leading into Coffeyville where gas is distributed by the Union Gas Corporation, now affiliated with the Southwestern. Field management of the company is in the hands of E. H. Huffman and J. E. Aitken, with headquarters at Coffeyville.

FOURTH ANNUAL DINNER

Southern California Gas Company held its fourth annual employee dinner, with 703 present, on January 7 in the Chamber of Commerce Building, Los Angeles.

MacFARLAND WITH LINCOLN

The Lincoln Electric Company of Cleveland, Ohio, announces the retention of A. M. MacFarland as a general sales and development engineer. He will devote his efforts to the development and special application of automatic carbon arc welding, with headquarters at Cleveland.

TEXAS TOWNS SOON TO GET DIXIE SUPPLY

Natural gas, from the Dixie Gas Company's 22-inch line from the Harrison and Panola County gas fields will soon be served to Nacogdoches, Texas, and other towns in that district. The line from the fields branches at Livingston, 75 miles south of Nacogdoches, a 16-inch branch going to Houston and an eighteen-inch branch going to Port Arthur and Orange. H. B. Wilder is district manager for the Dixie Gas Company at Nacogdoches.

AIRPLANE INSPECTION SHOWS PROGRESS ON DENVER LINE

ON January 10 V. L. Board, general superintendent of the Public Service Company of Colorado, and V. D. Stone of the company's budget department, flew over the completed portion of the line being built from Texas Panhandle gas fields to Denver, in a plane piloted by Mr. Stone, who is a first lieutenant in the Colorado National Air Corps.

On their return the men reported the pipe to be laid and covered for a distance of some 10 or 12 miles south of the Arkansas River and for a slightly greater distance north of the river. Pipe has been strung practically to Colorado Springs, 45 miles north of Pueblo, at that date. Headquarters for the construction project are at Devine, about seven miles east of Pueblo.

Cost figures on the Denver project are given roughly at $25,000,000 in a statement appearing in "Doherty News" for January 16, 1928. This statement concisely reviews the main features of the enterprise as follows:

"Total investment, including that in natural gas lands for distribution facilities in Colorado, will involve approximately $25,000,000. Work has progressed to a point where natural gas from Texas should be served in Denver in 1928.

"Interests participating in the joint program are Cities Service Company, which puts in 16,000 acres of gas lands in Amarillo field and will furnish the distribution of gas in Denver and Pueblo; Standard Oil Company of New Jersey and Southwestern Development Company, the latter being owned by Producers & Refiners Corporation and Mission Oil Company.

"From the New Mexico border the main part of the trunk line system will be owned by Colorado Interstate Gas Company, and this company will be jointly owned by Cities Service Company, Standard Oil Company of New Jersey and Southwestern Development Company. The main lines from Clayton will be 264 miles long, of which 156 miles will be 22-inch pipe to Pueblo. At that point one of the big contracts is to supply wholesale gas to the Colorado Fuel & Iron Company.

"The remaining 108 miles between Pueblo and Denver will be of 20-inch pipe, with smaller branch lines likely to cement plants nearby. Contracts have already been awarded and preliminary work started on the main trunk line, which will require 81,800 tons of pipe."

CHANGES IN SO. CALIF. GAS TITLES; NEW DIRECTORS

Additional changes in the Southern California Gas Company officership, following the recent merger of the Midway Gas Company and a number of smaller gas utilities into that organization, have been announced. T. J. Reynolds is now a vice-president of the company as well as general counsel, F. J. Schafer is general manager of the company, and Wm. Moeller, Jr., formerly general manager of the Midway, is now manager of the natural gas production and transmission department of the Southern California.

Seven names have been added to the directorate, those of John G. Bullock, Harold Janss and Stuart O'Melveny being representative business men of Los Angeles. Other new directors are Murray W. Dodge, Garrettson Dulin, Wm. F. Ingold and Charles A. Stone.

PAYNE FLOOR FURNACE
Wears Blue Star

IN ADDITION to the Payne UNIT FURNACE, the PAYNE all-welded, gas tight FLOOR FURNACE now wears the seal of approval of the American Gas Association.

This pipeless furnace is especially designed for smaller homes. It requires no basement and is suitable for heating one room or groups of rooms opening into each other.

The illustration shows a cross section of a typical Payne All-welded gas-tight Floor Furnace with a pilot light control for automatically lighting the gas the instant it is turned on.

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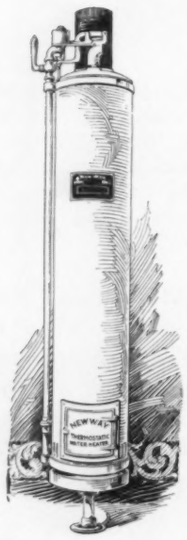

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NATURAL GAS GASOLINE OPERATIONS

Compiled by E. T. Knudsen

Department of Commerce, Bureau of Mines, Division of Mineral Resources and Statistics

ONE hundred and thirty-four natural-gas gasoline plants with a daily indicated capacity of 1,407,300 Thousand Cubic Feet, report a recovery of 42,287,622 gallons of natural-gas gasoline from 26,586,757 thousand cubic feet of gas treated in December. This is a decrease of 627 barrels in Daily Average Production.

Utilization of natural-gas gasoline amounted to 1,075,954 barrels, a decrease under November of 31,392 barrels. Daily average utilization of 34,708 barrels was 2,229 barrels more than Daily Average Production of 32,479 barrels.

Stocks of natural-gas gasoline at the end of December amounted to 599,216 barrels of which 30,344 barrels were reported by natural-gas gasoline plant operators and 568,872 barrels by refinery operators. This is a decrease of 69,106 barrels under November stocks. This stock figure of 599,216 barrels is approximately seventeen days supply at the current rate of consumption.

Production of gasoline during the month of December amounted to 5,234,202 barrels, a daily average of 168,845 barrels. This is an increase in total production of 64,710 barrels or 1.25 per cent over November output and an increase of 473,772 barrels or 9.95 per cent over the output of December 1926.

Of the total gasoline produced 26,403 barrels were reported as finished gasoline produced by natural-gas gasoline plant operators. Production of gasoline from Cracking Processes increased in December to 540,295 barrels.

Stocks of gasoline show a decrease of 1,448 barrels during December and at the end of the month amounted to 11,363,381 barrels. This stock figure includes 215 barrels of finished gasoline reported by natural-gas gasoline plant operators.

CALIFORNIA NATURAL GAS GASOLINE PRODUCTION, DISTRIBUTION AND STOCKS
DECEMBER, 1927

PRODUCTION

Type of Plant	*Gas Treated M.C.F.*	*Natural-Gas Gasoline Produced (Gallons)*	*Gasoline Recovery per M.C.F. Gas Treated*
Oil Absorption	16,972,334	27,608,518	1.627
Compressor	253,292	349,890	1.381
Combination Comp. and Oil Absorption	9,361,131	14,302,181	1.528
Drip	.....	27,033	.....
Totals	26,586,757	42,287,622	1.591

Finished Gasoline produced at plants—26,403 Bbls.

DISTRIBUTION

Stocks First of Month	.....		668,322 Bbl.
Production during Month	.....		1,006,848 "
Quantity Mixed with crude or unfinished oils	216,013 Bbl.		.....
Used in Blending at Refineries	854,023 "		.....
Stocks End of Month	599,216 "		.....
Used at Plants, Shortage and Evaporation Losses	5,918 "		.....
Totals	1,675,170 "		1,675,170 "

STOCKS

Natural-gas Gasoline held by Natural-gas Gasoline Plant Operators	1,274,463 Gals. or		30,344 Bbl.
Natural-gas Gasoline held by Refiners	23,892,624 " "		568,872 "
Totals	25,167,087 " "		599,216 "

Finished Gasoline (Motor Fuel) held by Natural-gas Gasoline Plant Operators—215 Barrels.

STANFORD AND WESTERN GAS CO. IN BUILDING PROGRAM

Construction on a $15,000 building to house the Stamford and Western Gas Company, Inc. will be begun in Stamford, Texas, within the near future according to report. The company has under way a project to supply natural gas to 18 towns in Central West Texas. Construction work was begun on the lines in November, and it is hoped that the entire system will be completed by June. Four hundred miles of pipe will be laid.

The towns to get natural gas through this development are: Stamford, Haskell, Anson, Rule, Hamlin, Roby, Rotan, Munday, Goree, Seymour, Vera, Benjamin, Knox City, Rochester, Rhineland, Wienert, Truscott and Gilliland. Four or five other towns embraced in that area will be added to this line in the near future.

LAY LINES IN BRADY, TEXAS

Eighteen lateral gas lines are being laid throughout the city of Brady, Texas, to completely serve the city with gas which has recently been turned into the principal mains of the city.

GAS FOR PAOLA, KANSAS

Paola, Kansas, is now being served gas through the Weisser line from fields in its own locality in the eastern half of Miami County.

REFUGIO GAS FIELD

The Houston Gulf Gas Company has discovered a new gas field in Refugio County, Texas, the discovery well being located four miles east of Refugio. The gas was found at a depth of 2,000 feet. A test made has shown the gas equal in quality to that of the original Refugio field.

Heat Transmission Equipment

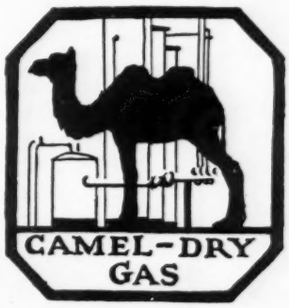
(Continued from Page 28)

easily be shown that, granting the conditions outlined in the preceding paragraph, the average effective temperature difference between cooling water and gas in such a cooler is the logarithmic mean of the temperature differences at the two ends of the Unit. There can be no doubt but that the use of the logarithmic mean in this case, employing the actual temperature differences at the two ends, is a far more dependable method of estimating heat transmission coefficients than the assumptions hitherto employed.

It is important to keep a second point in mind. The heat transmitted through the gas film is only the sensible heat of the gas and does not include the heat of condensation of the vapor. The reason for this is that the vapor travels through the gas film to the liquid layer on the surface of the pipe by diffusion in the vapor state, actual condensation occurring on the surface of the liquid film. Therefore the heat of condensation is liberated inside the gas film and hence does not have to travel through it. If now, one grant that the thermal resistances of water film on the outside of the cooling surface, of the metal wall and of the liquid film on the inside are all negligible in comparison with that of the gas film, it follows that one should calculate the heat transmission on the assumption that the sensible heat only of the gas is given up. It is true that the heat of condensation may be far greater in amount than the sensible heat of the gas but it takes care of itself, because there would be inappreciable thermal resistance between the point where it is liberated and the point where it is absorbed in the cooling medium. This does not mean that one can neglect this heat of condensation in calculating the amount of the cooling medium, but only in calculating the necessary surface for heat transmission by the use of the gas film conductivity coefficient. One must also keep in mind the fact that the sensible heat of the vapor is largely conducted through the gas film. Since condensation is linear with temperature drop, it follows that half of the sensible heat of the vapor condensed goes through the gas film by pure conduction. However, in the hotter parts of the system, the vapor diffusion through the film to a degree carries its sensible heat with it. It is probably a satisfactory approximation to assume that the heat thus carried is half the remainder, i.e. that the heat to be removed by pure conduction is three fourths of the sensible heat of the vapor.

So long as condensation is occurring, the thickness of the liquid film and therefore its thermal conductivity does not vary much with the amount of the condensation, because this thickness is determined by the readiness with which the condensate drains off the surface down to the lowest point of the pipe Thus it is found that for given conditions of cooling water temperature, pipe size and gas velocity, a gas condensing, roughly, fifteen gallons per thousand, will require double the condensing surface of a far leaner gas producing only a little condensate. Now the fifteen gallons of condensate will weigh approximately 75 pounds and have a specific heat of about 0.6, or a heat capacity of 45 B.t.u. per degree. Granting that three-fourths of this must be transmitted through the gas film by conduction, this means 34 B.t.u. per degree of cooling. Now

Billions of Bubbles



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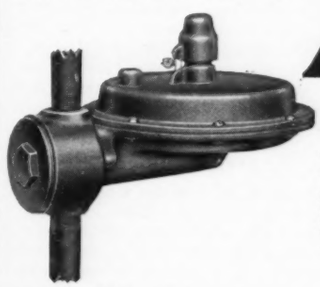

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the non-condensable gas is 1000/380=2.63 lb. mols. This gas will, in general, have a heat capacity of from 12 to 15 B.t.u. per lb. mol., or 31 to 40 B.t.u. per degree of cooling. In other words, that part of the sensible heat of the condensate which must be conducted through the gas film just about equals the sensible heat of the gas itself and therefore doubles the heat transmission load on the apparatus However, the heat of condensation of the liquid would be at least equal to the sum of sensible heat of both gas and vapor. Were this included, it would double the apparent overall coefficient of heat transmission.

It is entirely possible to cool and condense a gas-vapor mixture by the mechanism ordinarily assumed. Thus, if in the early stages of cooling one employ a cooling medium not too much lower in temperature than the gas, i.e., above its dew point, no condensation will occur until saturation is reached. Once the gas is saturated, further cooling tends to keep it on the saturation line. When cooling a hot gas with a cold medium, the condensate is formed at a low temperature and from a cold gas, despite the fact that the body of the gas as a whole is hot. Consequently the high boiling constituents tend to condense preferentially to a greater degree than when the cooling medium employed is higher in temperature, i.e., the condensate contains less dissolved low-boiling components. This is because the differences in relative volatility of components of different boiling points increase at lower temperatures. Thus, all of these factors operate in favor of lower temperature of the cooling medium.

Another important factor the signficance of which in recovery operations is often overlooked, is the influence of heat transmission on liquid friction, i.e., on the pressure drop through pipes and conduits. If one determines the pressure drop through an oil heater, one finds that the friction is considerably less than one would be led to anticipate from the ordinary formulas, even though the temperature be averaged carefully both longitudinally and radially. Conversely, in an oil cooler, the friction drop is high. Furthermore, this error can amount to over 100%, i.e., in an oil cooler the pressure may be double what one would anticipate from the ordinary formulas, even allowing for the temperature change as indicated above. This is particularly true, if, as is so often the case, conditions are such that the motion of the liquid in the pipe is viscous in character.

The explanation of these phenomena is undoubtedly the following:—If a liquid flowing through a pipe is being heated, the film of liquid immediately adjacent to the pipe wall is the hottest part of the whole fluid. Owing to its high temperature its viscosity is a minimum. Now this film is an exceedingly important factor in determining the friction of the fluid as a whole. Owing to its low viscosity, it serves in a sense as a lubricant to eliminate friction between the core of fluid flowing through the middle of the pipe and the pipe wall. Consequently, the pressure drop is abnormally low. Similarly, if the oil is being cooled, this surface layer is excessively viscous and since, per unit radial thickness, this layer transmits more oil than any other, the pressure drop becomes correspondingly high. This laboratory is working on a theoretical study of the problem and hopes to be able to present a workable engineering solution in the not too distant future. In the meanwhile the factor is one which the designing engineer must not ignore.

It is obvious that real progress in the development of the technique of gasoline recovery must be based upon a quantitative knowledge of the influence of plant conditions upon operating results. It is the conviction of the writer, based upon considerable experience in the industry, that it is most helpful to form the habit of analyzing the process under study so far as possible into its ultimate mechanism and using this visualization as a basis of quantitative interpretation of the results.

COMMERCIAL DEPT. CHANGES IN SO. COUNTIES OFFICES

C. D. Scott has been made commercial agent in Monrovia, Calif., for the Southern Counties Gas Company, after several years with the company in the Monrovia district. Another recent commercial appointment of the same company was that of Thomas G. Allender as commercial agent in the Ventura district. E. A. Hill has recently been added to the Ventura sales department.

MOVES PORTLAND OFFICES

Portland offices of the Northwest Gas & Electric Equipment Company are now located in the new Public Service Building, recently completed in Portland. Suite 704-5-6 is occupied by the equipment company.

"Make Machine Jobs of Hand-Labor Jobs," is the title of a new bulletin published by the Cleveland Trencher Company, Euclid, Ohio. The company's "Baby Digger" trencher is described.

NATURAL GASOLINE MEN PLAN ANNUAL CONVENTION

The Natural Gasoline Association of America will hold its next annual meeting in Tulsa, Oklahoma, on May 22, 23 and 24, according to an announcement made by A. V. Bourque, secretary of the association.

The program committee is composed of S. B. Carney, Chairman, Emby Kaye and E. L. Peck. Dr. G. G. Brown of the University of Michigan, who for the past two years has conducted research work on motor fuels for the association, will again be a headline attraction.

SIGNAL HAS TWO MORE PLANTS AT SIGNAL HILL

Completion of two new gasoline absorption plants in the Signal Hill field of southern California gives the Signal Gasoline Corporation a total daily recovery capacity of nearly 80,000 gallons. Five plants operated by the company at Signal Hill have been connected together by a 15-inch gas line.

PALESTINE, TEX., HAS NATURAL GAS FROM DIXIE GAS CO.

Natural gas replaced artificial gas in Palestine, Texas, last month. The gas is being piped by the Dixie Gas Company from the Louisiana fields. J. V. Murdaugh is local manager at Palestine.

AMERICAN CABLE APPOINTS PACIFIC COAST MANAGER

E. O. Johnstone, for many years in charge of American Chain Company activities on the Pacific Coast, has been appointed district sales manager of the American Cable Company for the Coast territory. Mr. Johnstone will make his headquarters as at present with the American Chain Company and associate companies at 425 Second Street, San Francisco.

COMMUNITY PIPES MORE TOWNS

The Community Natural Gas Company of Dallas, Texas, has just completed the piping of the following towns in its territory: Moody, McGregor, Gatesville, Lorena, Eddy, Troy, Bryan, Belton, Hubbard, Dawson, Coolidge and Malone.

COOPER CALENDAR

Another issue of the attractive calendar annually put out by the C. & G. Cooper Company of Mt. Vernon Ohio, has been released, and copies may be had by requesting them of the manufacturers.

CHANGES IN C. N. G. ASSN. DUE TO RESIGNATIONS

As a result of resignations tendered in January by two officers of the California Natural Gasoline Association, I. B. Funk and J. A. Campbell, a number of changes in that organization have been announced. I. B. Funk's place as vice-president has been filled by the election of H. L. Eggleston, manager of the Pan American's gas department. The two vacancies on the executive committee were filled by H. R. Linhoff and John N. Hicks, of the Richfield Oil Company and Superior Oil Company, respectively, both being directors of the association at the time of their election to the executive committee. E. L. Tobias of the Bankline Oil Company, and W. B. Smith of the Wilshire Oil Company were elected to the directorate.

Both Mr. Funk and Mr. Campbell have been active in the affairs of the association since its inception, and they still retain their respective chairmanships of the publications and the educational committees.

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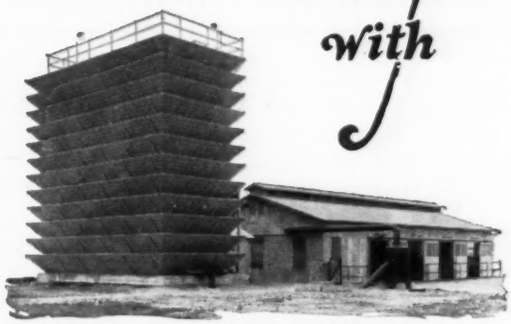

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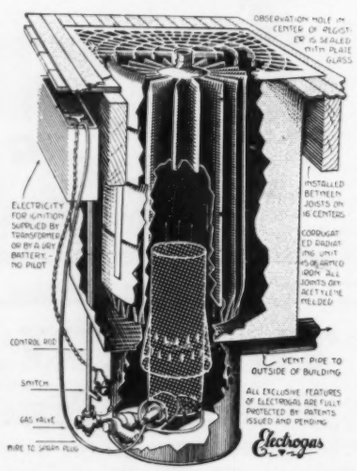
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GAS SERVICE CO. REVIEWS 1927 NEW BUSINESS GROWTH

A total of 2,376 house-heating installations which includes furnaces and conversion burners was sold during the year 1927 by the new business departments of the Gas Service Company, according to the annual New Business department report for the year which has just been compiled by Mr. Rosenkrans, new business manager of the company.

The continuation of the program of attaching house-heating business was the principal activity of the new business departments for the year. Equipment sold for house-heating in the past year included 407 gas designed boilers and furnaces, 1628 gas conversion burners and 341 gas-oil conversion burners. The gas-oil burners were not pioneered until the fall of the year. These burners are primarily gas conversion burners with an oil auxiliary which can be used in case of emergency and a customer can secure complete heating service regardless of any operating interruption or accident which might occur to the long natural gas pipeline supplying the distribution company.

The New Business department shows an increase in domestic revenue in 1927 over 1926 of $519,419, amounting to 5.9 per cent. The cubic foot increase of domestic gas sales was 4.6 per cent.

In the principal equipment sold by the commercial and industrial departments of the group are included 183 hotel ranges, 41 bake ovens, 70 industrial furnaces and 342 industrial gas burners, which were applied in converting existing equipment to gas.

The number of customers added to the entire company during the year was 4,237 which was an increase of 2.4 per cent. The number of customers now reached through the New Business department of the Company is 184,388.

The total number of appliances sold by the new business department was 24,483. An analysis has been made by Mr. Rosenkrans of the estimated annual consumption added through the sale of this equipment, the replacements being deducted in this estimate. This totals an increase of 713,267 M. C. F. of annual consumption.

Of the total 17,013 domestic appliances sold during the year, 10,112 of these were gas ranges, 1,395 storage heaters, 1,020 washers, 128 ironers and 293 hot plates.

PASO ROBLES TO BE ASKED FOR GAS CHARTER

City trustees of Paso Robles, Calif., will be asked for a gas franchise by John Beal of the Tracy, Calif., Gas Company, it was reported early in January. Application made some time ago in Paso Robles by this operator, was later withdrawn, but will be renewed, according to the report, within a month or more.

TAFT GASOLINE MEN ELECT

The Taft section of the California Natural Gasoline Association has elected W. F. Taylor of the O. C. Field Corporation its chairman for the coming year. On the executive committee are D. L. Taylor, A. M. Toller, C. R. Dole, Edward Grant, A. B. Scott and Ralph Cook.

GAS ORDINANCE PASSED

Perry, Okla., has recently passed an ordinance covering gas appliance connection and installation. All gas heaters on tanks, all furnaces and all ranges having flues, are required to be connected with brick, tile or other suitable flues. The ordinance also eliminates the use of all rubber, brass, lead and copper connections on stoves of all kinds.

This Plan Sells Gas *to* Entire Subdivisions

(Continued from Page 21)

from the gas company's angle, is the opportunity afforded for live sales contacts with the buying public. Each model home is virtually a sales depot for the gas company. The company representative is there at all hours of inspection, to sell the value of the gas equipment to the prospective buyer. From 50,000 to 100,000 people will visit this class of model home in Chicago. Among them are scores of prospects for gas equipment, and the company salesman takes the orders on the spot.

This subdivision sales plan is in the hands of Architect and Builder's Service Department of The Peoples Gas Light and Coke Company. Literally, scores of speculative builders in Chicago are "under fire" on the all-gas-subdivision plan. Some of the gilt-edge ones—(for the gas company must be absolutely sure of the financial ability of those who enter the agreement)—have already lined up. The gas industry will follow with unusual interest the final outworkings of this enterprising sales program.

A Monument *to* Public Service *in* Portland

(Continued from Page 24)

automatic system for inside calls and permitting of calling an outside number without first having to secure a line from the local operator. This leaves the local operators free to handle nothing but incoming calls. A 24-hour service is maintained.

EMPLOYEE FACILITIES

The third floor is devoted exclusively to the needs and comforts of employees. In one end is an auditorium seating 500 and provided with a stage and dressing rooms. On this floor are also the lunch room where employees may secure hot food at luncheon time, and lounge rooms for men and women, a first aid room, library and conference rooms.

The fourth, fifth and sixth floors contain the operating and executive offices of the Portland Gas & Coke Company, the Northwestern Electric Company and the Pacific Power and Light Company. On the seventh and eighth floors are the combined purchasing, paymaster, statistical and accounting offices of the three companies. The legal and executive offices are on the fifteenth floor and the half-story above is given over to studios, elevator apparatus, water and soap tanks.

BOTFIELD APPOINTS PROSSER

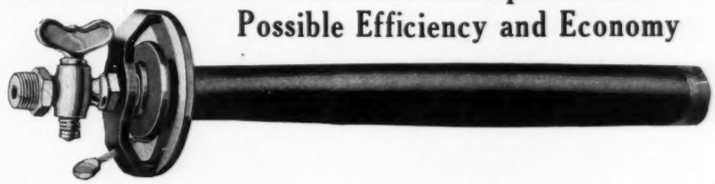
Botfield Refractories Company, Philadelphia, Pa., manufacturers of Adamant Fire Brick Cement, announces the appointment of Ires Prosser as Southeastern representative. Mr. Prosser's territory will embrace the entire Southeast from North Carolina to San Antonio, Texas. His headquarters will be Atlanta, Georgia.

CARBON PLANT AT BILLINGS

The Argonaut Petroleum Corporation has acquired acreage in the neighborhood of Billings, Mont., for the erection of a carbon black plant. It is reported that the output of a three-unit plant has already been contracted to eastern rubber manufacturers.

New Johnson Invention

Releases Johnson's Direct Jet Principle to Greatest Possible Efficiency and Economy



And now, after exhaustive research and experiment, Johnson Gas Appliance Company announces the perfection of the direct jet principle. In addition to a positive gas adjustment, a positive air adjustment has been developed whereby a greater supply of controlled air is admitted to a Venturi-shaped mixing tube. This mixing tube creates greater pressure than the old type of straight tube with the result that perfect combustion is attained.

Simple and Efficient

A hexagon nut adjustment produces a constant supply of gas. A thumb screw adjustment holds exactly the required air supply which passes through the new-type air port. This combination of controlled gas and air passes into the Venturi-shaped tube under high pressure and a thorough mixture of gas and air is the result. The Venturi-shaped tube gives this mixture sufficient snap to insure a flame of high heat temperature.

Johnson Burners Now Embody Perfected Principle

Johnson 60 BCE and 40 ABC Ring Burners, and 60 F Tee Head Unit Type Burners will henceforth embody the perfected principle as carried out by the new gas and air adjustments and the new Venturi-shaped mixing tubes.

New Principle May Be Applied to Any Burner

The new Johnson Valves, Mixers, and Venturi-shaped tubes may be purchased in any size for use in connection with burners of all types.

New Johnson Catalog Just Off the Press! Write for It!

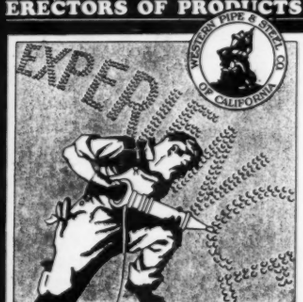
The new Johnson Catalog is now ready for distribution. It covers the entire Johnson line including the very latest additions and improvements. A readjustment of prices on some items is also shown. The new Johnson Catalog conforms with standard A.G.A. specifications for industrial gas series. You should have one of these interesting Catalogs on file for ready reference. It will be sent free on request.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. Babcock Co.
135 Bluxome Street San Francisco, California

W P & S

DESIGNERS, FABRICATORS & ERECTORS OF PRODUCTS OF STEEL



Investigate WESTERN Hi-Pressure Unit Gas Holders

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LOS ANGELES · SOUTH SAN FRANCISCO · FRESNO · PHOENIX · TAFT

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SPECIFY ARCO
PAINTS VARNISHES ENAMELS

WE kept in mind the severe conditions peculiar to the gas industry when many of the 6,819 Arco protective products were formulated. These specific paints were made to meet your particular needs.

Tell us your maintenence and finishing problems. We'll be glad to help you solve them. Why not write today . . . while this subject is fresh in mind?

THE ARCO COMPANY, Cleveland, Ohio
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(128)

MAAS
Water Reagents
Are Scientifically Prepared After an Analysis of the Water to Remove Scale Forming Elements

Maas Water Reagents are not patented "cure-alls." All elements contributing to the forming of scale are studied and a reagent developed specially in the Mass Laboratories for the purpose.

A R M M

Manufactured by
Arthur R. Maas
Chemist
308 East Eighth St.
Los Angeles, California

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

Color *in* the Kitchen

(Continued from Page 35)

hung towels of different design, all trimmed in green), the bathroom mat for use in front of sink, the spice cabinet on the wall, the broom and mop handles, the dust pan, the ironing board support—even the handles to the flat iron, percolator and food chopper.

Glassware was of the Czecho-Slovakian translucent green variety, green enameled cooking utensils were prominent, and several of them were set on the range, showing the exact color match which discriminating housewives would demand.

Close color harmony was just as evident in the May Company's red kitchen display, and both windows literally stopped the crowds for minutes at a time, with the colored ranges holding the center of attention.

To the gas company window display department the colored range is a boon, comparable almost to the refrigerator in interest value. And those gas companies will be wise which use this strong appeal to the limit right now when it means most, for competitive fuel range makers will not overlook this possibility for styling up their product. Some western companies have already taken steps to cash in on the colored range's popular appeal, seeing their underlying opportunity which ranks more heavily than the mere merchandise sales involved.

In Southern California, for example, gas companies have been fast to put the new feature to work. Colored ranges were used in the opening of the Southern Counties Gas Company's Santa Barbara office in January. They were the occasion for the Southern California Gas Company's window display shown with this article—and it is not surprising that the first range sale, made the morning after opening this display was for a colored model. The same Company will this month display a colored range at the Orange Show in San Bernardino, a spectacle which annually draws more than a quarter million attendance during its ten-day period.

Something unusual will be done in this Orange Show display. Instead of exhibiting rows of ranges and miscellaneous gas appliances, the gas company will show one model kitchen, in color, complete in every detail, with the object of tieing the gas range into the housewife's visualization of her future colored kitchen. A "color in the kitchen" edition of "Gas Lines," Southern California Gas Company's consumer publication, is also contemplated for the near future, to feature the colored range.

With blue, red, green and yellow numbers available in a variety of trims the gas range can be fitted into almost any practical color scheme for the kitchen. Many a range user who has been "making the old one do" will be put in the buying class by the introduction of color. Fortunately, most of the colored range lines have been priced close to the full enamel level, so that the middle class pocket book can be reached with the new article. Housewives, inspired by the colored range, are going to insist on more cheerful kitchens; and with such kitchens once achieved the work of the home will be still farther removed from its one-time status of drudgery—all of which should have an ultimate effect upon the domestic gas sendout.

ANAHEIM OFFICE OPENED

Late in January the Southern Counties formally opened its new $40,000 office at Anaheim, Calif.

ANACONDA COPPER PLANT TO BURN NATURAL GAS

J. R. Hobbins of Butte, Montana, vice-president of the Anaconda Copper Mining Company, is reported to have announced the signing of a contract with the Montana Cities Gas Company under which the Great Falls reduction plant of his company will use natural gas for fuel, replacing fuel oil and coal. The same press report states that conversion of the copper reduction plant to gas, to cost approximately $100,000, is expected to begin very shortly. The Montana Cities Gas Company supplies natural gas to the Great Falls Gas Company for distribution in Great Falls.

LINE TO HUTCHINSON

The Kansas City Pipe Line Company, subsidiary of the North American and Studebaker interests, is preparing to lay an eight-inch gas line from the McPherson County gas field to Hutchinson, Kansas.

LONE STAR RECAPITALIZING

The Lone Star Gas Company of Dallas, Texas, is arranging to increase its capital stock from $30,000,000 to $50,000,000 through a plan of recapitalization outlined late in 1927. The controlling interest of the company will not be sold in this change, L. B. Denning, president of the company, stated.

Stock outstanding on March 31 amounted to $26,959,925, at $25 par capital stock. Stockholders of record August 30, 1926, may buy new stock to the extent of 20 per cent of their $25 per share holdings.

COLD SNAP IN SOUTH TEXAS MAKES SAN ANTONIO HIGH RECORD

The cold snap in Southwest Texas during the first week in January resulted in a record consumption of domestic natural gas in San Antonio. Consumption on one day during the week was 29,447,000 cubic feet. The public service company of San Antonio buys gas from the Southern Gas Company, the supply coming from the Laredo, Medina county and Three Rivers districts.

NEW LINES INCREASE SUPPLY OF K. C. DOMESTIC GAS

Two new 16-inch gas lines from Gavin Cut, Kansas, to Kansas City, have been added to the Doherty interests' gas system at a cost of roughly $500,000. This new service is expected to increase the domestic gas to Kansas City considerably. These two lines have the capacity of adding 40,000,000 cubic feet of gas daily to the city's present supply. A metering station has also been completed at Gavin Cut, the central point between the fields of Oklahoma and Kansas and the lines' terminal in Kansas City.

NEW MAINS IN NOGALES

Southern Arizona Power Company has under way a complete new gas distribution system for Nogales, Ariz. Gas mains and fittings were ordered on December 28, and work of laying them began in January.

SELLS MOUND VALLEY GAS CO.

Geo. F. Jepson, owner and manager of the Mound Valley Natural Gas Company, Mound Valley, Kan., has sold that utility to Roth & Farout of Independence, Kansas.

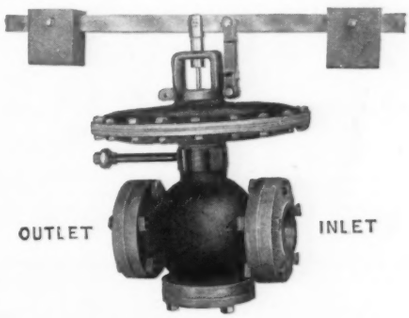
LOMITA GASOLINE PLANT BUILT BY CAMPBELL

J. A. Campbell has just completed a 20,000-gallon absorption plant for the Lomita Gasoline Company, Long Beach, California, Campbell equipment being used throughout. L. V. Cassady is superintendent of the Lomita company.

For District or Individual Service—
The Weighed Illuminated Regulator

A medium pressure of 15 pounds or less is reduced to a delivery pressure of a few inches reduced to a delivery pressure of a few inches of water.

This is but one of the valves described in our catalog. Sent on request.



The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes, From 1 Inch to 24 Inches; For All Service. 1 oz. up to 1,600 lbs. Pressure to Square Inch.

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Sales and Service
Dallas—Los Angeles—Tulsa

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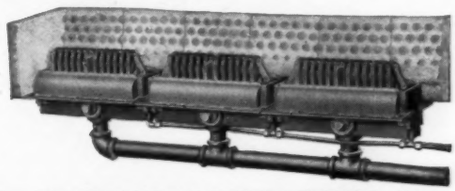
Sales Engineer
1855 Industrial St. Los Angeles

R. M. C. Gas Burner



R. M. C. RADIANT TILE Setting

ROTARY MANUFACTURING CO.

5720 Long Beach Avenue Los Angeles, California

KEY *Special* PIPE JOINT COMPOUND

Water-Proof

KEY SPECIAL PIPE JOINT COMPOUND will effectively seal screw thread and gasket joints for such service as Gas, Water, Steam, Compressed Air, etc.

One of the many advantages this compound has over the commonly used red leads and oils, etc., is that the pigment will not settle to the bottom of the container, thereby holding the contents in equal suspension at all times ready for service.

KEY SPECIAL PIPE COMPOUND is not a quick hardening cement but a plastic lubricant and filler that will seal the most obstinate joint with ease.

You may test the high quality of this product by taking a small quantity between the fingers which will immediately demonstrate the wonderful lubricating qualities along with the "pull or drag" that makes possible a permanent seal without resorting to cementing materials, most of which are very undesirable and impracticable to use.

Write for **FREE** Sample

E. A. Key Co., Inc.
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The Magic Way Company

Gas Heating Devices

including

"Magic Way" Gas Furnaces
"Magic Way" Control Valves and Switches
"Potter" Radiators
"Steel Made" Radiators
"Cole" Floor and Wall Heaters
"Hall" Floor Furnaces

Manufactured by

Magic Way Company

National City San Diego California

Largest Engineering *and* Construction Company

THE largest engineering and construction company in this country has been organized in Philadelphia, according to a statement issued by Arthur W. Thompson, president of The United Gas Improvement Company. "Four firms, widely known in this and other countries, have combined their interests and organized the United Engineers & Constructors, Inc.," said Mr Thompson. "These companies are The U. G. I. Contracting Company, Philadelphia; the Public Service Production Company, Newark; Dwight P. Robinson & Company, Inc., New York; and Day & Zimmermann Engineering & Construction Company, Philadelphia. Headquarters of the new company will be in Philadelphia, wtih offices in New York, Newark, Chicago, Los Angeles, Atlanta, Houston, Pittsburgh, Montreal, Buenos Aires and Rio de Janeiro."

Dwight P. Robinson is president of the company. The directors are Arthur W. Thompson, president, The United Gas Improvement Company, chairman; Dwight P. Robinson; Thomas N. McCarter, president, Public Service Corporation of New Jersey; Samuel T. Bodine, chairman, Board of Directors, The United Gas Improvement Company; Paul Thompson, a vice-president of The United Gas Improvement Company and president of the Philadelphia Gas Works Company, and John E. Zimmermann, president of Day & Zimmermann, Inc.

The new company is launched with contracts in hand amounting to more than $100,000,000.

DWIGHT P. ROBINSON

Dwight P. Robinson has for 35 years been engaged in bringing large construction enterprises to completion with speed and economy. He was born in Boston, May 1, 1869. In 1890 he was graduated from Harvard and two years later from the Massachusetts Institute of Technology, where he obtained his electrical engineering education. After graduation, he was an assistant in the mechanical engineering laboratory at the latter institution and in 1893 joined the organization of Stone & Webster. Within a few months he was placed in charge of the Chicago office of that company. From 1895 until 1903, he was engaged in operating light and power properties under Stone & Webster management.

In 1903 Mr. Robinson returned to Boston in charge of all Stone & Webster engineering, and when the Stone & Webster Engineering Corporation was formed he was made president in charge of both engineering and construction activities. In 1912 he was admitted to partnership. From 1912 to 1918 he had charge of notable hydro-electric developments in Washington, California, Connecticut, Maine, Georgia and Montana, and the building of steam power stations at Seattle, Minneapolis, Boston, Houghton (Mich.), Savannah, Jacksonville, Tampa, Pensacola, Columbus, Dallas, Fort Worth, El Paso, Houston, Port Arthur, Pittsfield, New Bedford and Bridgewater, Mass.

With his capable personnel organization Mr. Robinson, as first president of the American International Shipbuilding Corporation, developed Hog Island. He resigned from this company in the spring of 1918 and in the fall of that year he organized Dwight P. Robinson & Company, Inc., New York, to conduct an engineering and construction business.

In 1920, Dwight P. Robinson & Company absorbed Westinghouse, Church, Kerr & Co., established in 1884, and nationally known as railroad and industrial builders.

Dwight P. Robinson & Company's activities, in addition to extensive office, hotel and apartment building work, include the design and construction of steam power stations, hydro-electric developments, sub-stations, transmission systems, railroad shops, freight terminals, electrification of railroads, locomotive and passenger terminals, coaling stations, sugar refineries, smelters, lead plants, fertilizer plants lumber mills, tanneries, shops, steel mills, foundries, textile mills, chemical plants, pipe lines and pumping stations, filtration and disposal plants, harbor and dock works.

The company has performed a large volume of work abroad, including irrigation projects for the Brazilian Government in northeastern Brazil, the construction of the Embassy of the United States at Rio de Janeiro and of the exhibits buildings during the Brazilian Centennial Exposition and the erection of an office building for the Rio de Janeiro Tramway, Light & Power Company, now in progress. In addition, important work is being undertaken in Argentina. A consulate building for the United States Government at Seville, Spain, and two exhibition buildings for the Iberian-American Exposition are other projects of the immediate future.

U. G. I. CONTRACTING COMPANY

The U. G. I. Contracting Company's operations date back to 1882, when The United Gas Improvement Company was incorporated to engage in engineering and construction. After the U. G. I. had branched out into the operation and management of utility properties, it continued the contracting business as a construction department. For years the principal work was building and installing Lowe carburetted water gas plants, patents for which were held by U. G. I. The operations expanded, taking in the building of coal gas and electric power plants and manufacturing and applying road binders.

The U. G. I. Contracting Company was incorporated in April, 1919. It has built and equipped gas and electric plants, office buildings, factories, bridges, piers, tunnels and roads. It has built more than 1000 carburetted water gas plants. Recently it acquired the rights to build the German "Stettiner" coal gas ovens in America.

Among the steam power plants built by The U. G. I. Contracting Company are the 50,000 K.V.A. Barbadoes Island station, near Norristown, Pa., the 75,000 K.V.A. Devon (Conn.) station, the 37,500 K.V.A. Big Sioux (Sioux City, Ia.) station and the 33,333 K.V.A. station of the Comal Power Company, New Braunfels, Texas. It also built the Stevenson dam and power plant on the Housatonic River in Connecticut and four dams and locks on the Ohio River for the United States Government, which form part of the Government's program to make the river navigable at all times. It has under construction extensive hydro-electric developments in Connecticut and Vermont.

PUBLIC SERVICE PRODUCTION COMPANY

Public Service Production Company, a subsidiary of Public Service Corporation of New Jersey, was incorporated January 27, 1922. It built the $33,000,000 Kearny Electric Station, the Harrison Gas Works of Public Service, as well as a large number of sub-stations, garages and other buildings, and has done other work of importance for these organizations. It has also built roads

"McEVERLAST"

(Registered)

Protective Coatings

Our two corrosion-defying products, "McEVERLAST" Luminite (aluminum colored), and No. 99 Non-Corrosive Coating (maroon colored) are giving unequalled service on steel and wooden tanks, and are made to stand up under the hardest possible conditions.

"McEVERLAST" Electrolysis Proof Pipe Line Coatings, by every test, which includes actual use in the field, have shown they are the most resistant to electrolysis, acids, alkali and salt water of any pipe protection it is possible to obtain.

These coatings are being used extensively by some of the largest corporations in the Southwest, whose names we will gladly furnish upon request.

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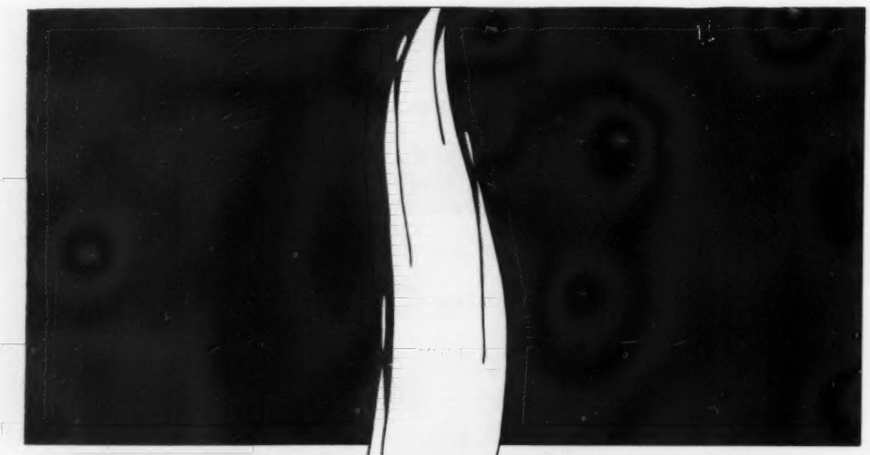

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LININGS, CHECKERS and BOILER SETTINGS are carried in stock for quick shipment. If special or hand-made shapes are required, our plant is especially equipped to make them.

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Lampblack Dewatering
This is the way it's done.

Scrubber Wash Water

Oliver-Borden Thickner

Clear Water to discharge — Thickened Sludge

Oliver Filter

Clear Water to discharge or re-use. — Lampblack to Furnaces or Presses

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5th & Madison Sts.

HONOLULU, T. H.
W. A. Ramsay, Ltd.

in many states, has erected several important mills and factories and office buildings, including the 18-story Federal Trust Company building, Newark, and has performed many engineering and construction services for public utility, industrial concerns and steam railroads.

Day & Zimmermann Engineering & Construction Company was organized by Day & Zimmermann, Inc., to handle their engineering and construction activities. This firm has a background of over 25 years of experience in the layout, design and construction of industrial plants, power plants, transmission lines and a wide variety of general structures such as hotels, office buildings, warehouses, and port terminal developments. The 220,000-volt transmission lines from Conowingo to the Philadelphia territory are now under construction by this organization. It has designed and constructed hydro-electric and steam-electric power plants such as the 60,000 K.W. Saxton station for Penn Central Light & Power Company. During the War period Day & Zimmermann did work for the United States Army, the Navy, the Shipping Board and the Alien Property Custodian. Included among the projects done for government agencies was the United States Army Supply Base at Philadelphia, comprising the largest piers and warehouses in the port of Philadelphia. For many years Day & Zimmermann have been engaged in the layout and construction of large industrial enterprises among which have been new plants for the International Harvester Company, American Type Founders Company, Erie Forge and Steel Company, and many others. Latterly, Day & Zimmermann have entered the field of hotel and hospital construction and have built major hotels in Rhode Island, Connecticut, Pennsylvania, New Jersey, Virginia and Florida. The work of Day & Zimmermann Engineering & Construction Company is entirely separate from the investigation, reports and management work which is done by Day & Zimmermann, Inc.

With the work now under way, including the construction of large dams for the Government on the Ohio River, extensive hydro-electric development on the Housatonic River, Connecticut, important work in South America and Spain and large office and apartment buildings in New York and other cities, the United Engineers & Constructors, Inc., starts business with an unusual program.

WEST TEXAS GAS COMPANY IS INTERESTED IN EL PASO LINE

The West Texas Gas Company, subsidiary of the Prairie Oil and Gas Company, is conducting a preliminary survey according to report, for a gas line from the Panhandle fields through the Pecos Valley of New Mexico to El Paso. If the project materializes the line will cover a distance of approximately 400 miles.

PHILLIPS PETROLEUM ASKS TO BUILD CARBON BLACK UNITS

Residue gas in Hutchinson and Carson counties and in Gray county, in the Texas Panhandle, will be burned for carbon black if application of the Phillips Petroleum Company for permission to construct two carbon black plants in these localities receives sanction.

CRESCENT NOW HAS GAS

A new gas distribution system has been installed at Crescent, Okla., by the Oklahoma Central Gas Company. The supply is furnished by the Texas and Pacific Company.

NUMEROUS OKLAHOMA TOWNS TO VOTE ON GAS FRANCHISES

Several Oklahoma towns are scheduled to vote on natural gas franchises during the next two months. Carnegie, Caddo County, was to vote January 24 on granting a franchise to Geo. H. Lowerre, Jr., the distribution system to be installed not later than June 30, 1928, if the franchise is granted. Kingfisher city commissioners have approved the calling of a gas franchise election to be held probably February 7. A. C. Black of Fort Smith, Arkansas, and O. F. Gould of Tulsa, are the applicants for the franchise. These men are also planning on constructing a gas line to Dover and Hennessey if franchises can be secured. The town board of Gage has approved granting a gas franchise to the Winchester Oil & Gas Company subject to approval at a special election, the date of which has not yet been announced. C. N. Haskell of Muskogee, first governor of Oklahoma, and L. E. Haskell have been granted a 25-year gas franchise by the city council of Tahlequah, Okla., and a special election will be held February 14, to pass on the franchise.

7.6% GAIN IN NET EARNINGS OF STANDARD G. AND E.

Standard Gas and Electric Company net earnings for the year ended November 30, 1927, showed an increase of $4,437,822, or 7.6 per cent compared with those of the year previous. Gross earnings increased more than $6,000,000, amounting to a 4.3 per cent gain

Western units of the Standard Gas and Electric Company showed comfortable increases, that of the San Diego Consolidated Gas and Electric Company being from $2,552,302 to $3,040,663 in net earnings before provisions for retirements. Similar increase of the Oklahoma Gas and Electric Company was from $3,985,681 to $5,379,200.

MAY PIPE TEXAS GAS TO WESTERN KANSAS

Preliminary plans are under way by the East Plains Gas Company for a pipeline from the Panhandle fields to Kansas to serve communities in the western part of that state, according to press reports. The line will terminate at Wellington, Kansas, and natural gas will be supplied to the towns along the line, for which franchises have already been secured. The gas will be supplied from wells in the western part of Hutchinson County.

ARKANSAS NATURAL GAS, SOUTHWESTERN G. AND E., PURCHASED

The Cities Service Company unit of Henry L. Doherty & Company has acquired the Arkansas Natural Gas Company, and the properties of the Southwestern Gas and Electric Company, subject to the approval of the stockholders of the companies involved.

The Arkansas Natural Gas Company was formerly owned by Benedum and Trees of Pittsburgh, and the Insull interests owned the Southwestern Gas and Electric Company. The purchased properties cover an area from Shreveport, La., to Little Rock, Ark., with branches extending to Pine Bluff, Hot Springs and Texarkana.

Approximately 74,000 patrons are served by the two utilities, whose systems comprise about 1,000 miles of transporting and distributing lines, six gas compressor stations of 16,000 horsepower and three gasoline extraction plants with a yearly capacity of more than 5,000,000 gallons. Gas sales in 1927 amounted to 23 billion cubic feet.

The Reliance Balanced Valve Regulator

An addition to the Reliance line, which for positive lockup, close regulation, large capacity, low cost of upkeep and accessibility will further increase the prestige of the Reliance.

Reliance Manufacturing Company

1000 Meridian Street **Alhambra, California**

WESTERN GAS
626 South Spring Street,
Los Angeles, California .....192.....

Starting with the next monthly issue, you may send WESTERN GAS to the undersigned. Upon receipt of invoice, remittance will be sent to cover (1 year $2.00) or (3 years $5.00).

Name ..... *Title* .....

Company .....

Address .....

City and State .....

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Subscription: 1 Year, $2.00; 3 Years, $5.00, in Advance

A WESTERN GUIDE to INDUSTRIAL PURCHASING

Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

Absorption and Compression Plant Equipment
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell.
Chaplin-Fulton Mfg. Co.
Fluor Construction Co.
Jackson Engr. & Equip. Co.
Jensen Instrument Co.
The E. A. Key Company
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Absorption Towers
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Adjustable Plugs
Lattimer-Stevens Co.
Western Pipe & Steel Co.

Agitators
Baker Iron Works.
The Bartlett-Hayward Co.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
W. P. Fuller & Co.
Hill, Hubbell & Co.

Analyzers
C. F Braun & Co.
A. R. Maas, Laboratories.
Smith-Emery Co.

Annealers (Bar, Blank, Strip)
Pacific Meter Works.

Anti-Fluctuators
Pacific Meter Works.

Apparatus, Experimental Gas
The Bartlett Hayward Co.
Pacific Meter Works.

Appraisals and Valuations
Charles R. Collins.
Smith-Emery Co.

Automobile Tires
Truck Tire Service Co.

Bags, Gas Main
C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
Mueller Co.
Safety Gas Main Stopper Co.
Semet-Solvey Engr. Corpn.

Barometers
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
The Bartlett Hayward Co.
General Gas Light Co.

Blast Gates
Semet-Solvay Engr. Corpn.

Blocks and Tiles, Fire Clay
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Blowers and Boosters
Ingersoll-Rand Co.

Boiler—Brickwork
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
C. B. Babcock Co.
Baker Iron Works.

Boiler Settings, Pipe and Boiler Insulation
Pioneer Paper Company.
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
Baker Iron Works.
The Bartlett Hayward Co.

Boilers, Water Tube
Baker Iron Works.
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Boxes
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Brass (rods, sheets, tubes, wire)
Mueller Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Brick, Firebrick
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Brick, Firebrick—Installation
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Buildings, Steel
Baker Iron Works.
Western Pipe & Steel Co.

Bunkers, Steel and Concrete
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Burners, High Pressure
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B. Babcock Co.
The Bartlett Hayward Co.
General Gas Light Co.
Johnson Gas Appliance Co.
Lee B. Mettler.
Payne Furnace & Supply Co.
Rotary Manufacturing Co.
Standard Gas Equipment Corp.

Burners—Oil
Rotary Manufacturing Co.

By-product Recovery Apparatus
The Bartlett Hayward Co.
Oliver Continuous Filter Co.
Semet-Solvay Engr. Corpn.

Calorimeter Accessories
Pacific Meter Works.

Calorimeters
Pacific Meter Works.

Cases, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Casinghead, Gas Meters
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Casing and Tubing (steel)
Semet-Solvay Engr. Corpn.
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
Semet-Solvey Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Castings
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Cement
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Cement—Plastic
Pioneer Paper Company.

Centrifugal Pipe
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc.)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Checker Brick
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
Pacific Meter Works.
Stauffer Chemical Co.
Westcott & Greis, Inc.

Chemists, Analytical
A. R. Maas, Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Charles R. Collins.
Semet-Solvay Engr. Corpn.
The Bartlett Hayward Co.

Coal Tar Products and Chemicals
W. P. Fuller & Co.
A. R. Maas, Laboratories.

Cocks
C. B. Babcock Co.
Johnson Gas Appliance Co.
Lattimer-Stevens Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Collectors, Dust
Western Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Compressors, Air
The C. & G. Cooper Co.
Ingersoll-Rand Co.
Oliver Continuous Filter Co.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.

Condensers
Baker Iron Works.
The Bartlett Hayward Co.
C. F. Braun & Co.
Ingersoll-Rand Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Condenser Boxes
Baker Iron Works.

Condenser Tubes
Semet-Solvay Engr. Corpn.

Controllers
Jensen Instrument Co.
The Foxboro Co., Inc.

Controls, Air and Steam
Jensen Instrument Co.
The Bartlett Hayward Co.
C. F. Braun & Co.
The Foxboro Co., Inc.

Cooling Systems
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Cooling Towers
C. F. Braun & Co.
J. A. Campbell
Fluor Construction Co.
J. B. Gill Corporation.
Jackson Engr. & Equip. Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Counters, Revolution
Jensen Instrument Co.

Couplings
Pittsburgh Equitable Meter Co
The Bartlett Hayward Co.

Coverings (Tank, Boiler, Cold and Steam Pipe)
Pioneer Paper Company.

Cubic Foot Bottle
Pacific Meter Works.

Cutters, Pavement
Ingersoll-Rand Co.

Cutters, Pavement
Ingersoll-Rand Co.

Cylinders, Compressor
The C. & G. Cooper Co.
Semet-Solvay Engr. Corpn.

Dephlegmaters
C. F. Braun & Co.
J. A. Campbell
Southwestern Engineering Corp.
Semet-Solvey Engr. Corpn.
Western Pipe & Steel Co.

Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Diggers, Clay
Ingersoll-Rand Co.

Discharging Machines (retort, etc.)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Displacement System, Tar
Semet-Solvey Engr. Corpn.

Door, Clean-out
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Drills
Ingersoll-Rand Co.
Mueller Co.

Drill Pipe—Iron
South Chester Tube Company

Drill Pipe—Steel
South Chester Tube Company

Dryers—Domestic Laundry, Commercial Laundry, Laboratory, Industrial.
The W. E. Lamneck Co.

Dryers—Blue Prints, Photograph film, etc.
The W. E. Lamneck Co.

Dryers—Dehydrating Fruits,
The W. E. Lamneck Co.

Elevators
Baker Iron Works.

Engineers and Engineering Service
J. A. Campbell
Charles R. Collins.
J. B. Gill Corporation.
The Bartlett Hayward Co.
A. R. Maas, Laboratories.
Smith-Emery Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Engines, Diesel
The C. & G. Cooper Co.

Engines, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Oil
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Steam
Ingersoll-Rand Co.

Evaporating Apparatus
The Bartlett Hayward Co.
C. F. Braun & Co.
United States Cast Iron Pipe and Foundry Co.
Southwestern Engineering Corp.

Excavators, Ditch and Trench
The Cleveland Trencher Co.

Exchangers, Heat
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Exhausters
Ingersoll-Rand Co.
United States Cast Iron Pipe and Foundry Co.

Experimental Apparatus
The Bartlett Hayward Co.
Pacific Meter Works.

Extractors
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Faucets, Drain
Mueller Co.

Felt—Deadening
Pioneer Paper Company.

Filters
Oliver Continuous Filter Co.
United States Cast Iron Pipe and Foundry Co.

Fire Clay and Products
Gladding, McBean & Co.
Stockton Fire Brick Co.

Fire Brick Contractors
J. T. Thorpe & Son, Inc.
Stockton Fire Brick Co.

Fittings
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Fixtures, Lighting (Domes, Portables, etc.)
C. B. Babcock Co.
Welsbach Company.

Feed Water Heaters
C. F. Braun & Co.
Southwestern Engineering Corp.

Fire Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.
Semet-Solvay Engr. Corpn.

Flanges
Pittsburgh Equitable Meter Co
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Flooring—Industrial
Pioneer Paper Company.

Forgings
Baker Iron Works.
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Geo. D. Roper Corporation.
J. T. Thorpe & Son, Inc.

Furnaces, Floor
Magic Way Company
Payne Furnace & Supply Co.
Pacific Gas Heating Co.

Furnaces, Heating
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Magic Way Company.

Furnaces, Lead Melting
C. B. Babcock Co.
The Estate Stove Co.
Johnson Gas Appliance Co.
Mueller Co.
Payne Furnace & Supply Co.

Gas Analysis Apparatus
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.

Gas Masks
Safety Gas Main Stopper Co.

Gas Main Tapping & Drilling Machines
Mueller Co.

Gaskets
The E. A. Key Company
Pittsburgh Equitable Meter Co
Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.

Gasket Compound
W. P. Fuller & Co.
E. A. Key Co.

Gasometer
Pacific Meter Works.
Semet-Solvay Engr. Corpn.

Gas Pipe Line Construction
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Gauges
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge.

Situations Wanted

Note: *Western Gas* will publish free of charge, under this heading, advertisements of situations wanted. Maximum length, 50 words; additional space at classified rates five cents per word per insertion. Copy should be neatly typewritten on one side of paper only, and should be mailed to reach *Western Gas* not later than the 20th day of the month prior to publication date.

Distribution Superintendent with small or medium sized company. Thirty-three years old. Fourteen years experience with manufactured and natural gas. Last employed as District Manager. Best of references. A-12, care of *Western Gas*, 626 South Spring St., Los Angeles.

Woman applicant with over nine years secretarial and stenographic experience desires similar work in southern California. Satisfactory references from utility field can be furnished. Available for position after March 1. Address A-13, care of *Western Gas*, 626 South Spring St., Los Angeles.

LONE STAR ERECTING AUTO AND METER REPAIR SHOP

A contract has been let by the Lone Star Gas Company of Dallas, Texas, for the erection of a central automobile and meter repair plant at a finished cost of approximately $90,000, including plant equipment. The plant will also contain a warehouse, a machine repair shop and regulator repair shop.

It is estimated that the length of the life of the automotive equipment maintained by the company will be practically doubled through the service of what is termed the "re-manufacturing" department of the plant. The building, which is 112 ft. by 180 ft., is to be completed about March 1st.

LARGE LOUISIANA LINE IS IN PROSPECT FOR 1928

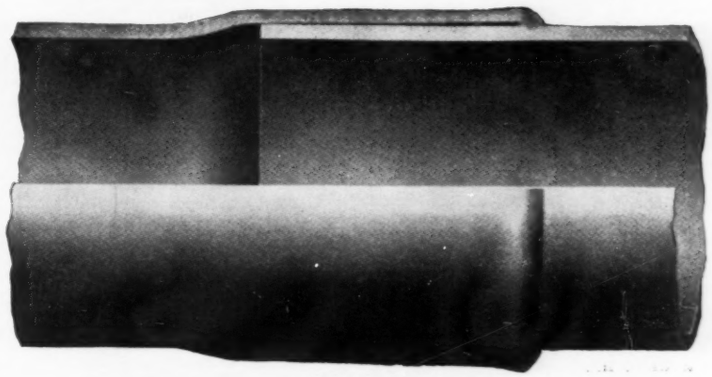
Belchic & Laskey of Shreveport, La., are planning a 240-mile 16-inch line from Richland gas fields almost to the coast, to serve some 25 or 30 towns in south central and southwestern Louisiana. The $6,000,000 project is planned to be complete by August or September of this year, according to reports.

NATURAL GAS IN AUSTIN

Natural gas will be served in the city of Austin, Texas, on or about February 1, it is expected. The high pressure main from New Braunfels is now being laid, and high pressure mains are going down in Austin.

The Refinery Supply Company of Tulsa, Okla., has purchased the Acme Company of Dallas, Texas, and will maintain a branch office at 304-6 Main St. R. E. Copman is to be in charge of the Dallas office.

PIPE SERVICE BEGINS WHERE THE PIPE IS MADE



(Patented)

"ASTCO" Seamless Steel Slip Joint LINE PIPE

The only method by which dependable pipe service can be transmitted to you, through the finished product, is in the quality of material used and the process of fabrication at the mill.

Unfailing service of superior character is literally built into "ASTCO" Seamless Steel Line Pipe through the mediums of high quality Siemens-Martin Steel of high carbon content, and the Mannesmann-Pilger process of manufacture, insuring exceptional strength and high resistance to deterioration.

Complete data and specifications for life time pipe lines of every type furnished on request.

AMERICAN SEAMLESS TUBE CORPORATION OF CALIFORNIA

Petroleum Securities Building. *Los Angeles, California*

535 5th. Ave. New York City

STRENGTH RESISTANCE ASTCO DURABILITY

1211 Neils Esperson Bldg. Houston, Texas

Trade Mark Reg.

Fire Brick Contractors

Established 1906

J. T. Thorpe & Son

Inc.

Specializing in Gas Generator, Boiler, Still and Furnace Brick, Industrial Furnaces, Retorts, Kilns, Brick Smokestacks.

A capable Engineering Department competent to advise on any problem involving firebrick construction.

San Francisco	Seattle	Portland	Los Angeles
417 Market St.	939 Stewart Bldg.	609 Ry. Exch. Bldg.	321 W. 3d St.

Gauges, Steam
Jensen Instrument Co.
Semet-Solvay Engr. Corpn.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Gauges, U Type
C. B. Babcock Co.
Jensen Instrument Co.
Lee B. Mettler.
Pacific Meter Works.
Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Generators, Water Gas
The Bartlett Hayward Co.
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Glassware
Westcott & Gries, Inc.

Governors
C. B. Babcock Co.
Chaplin-Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Pacific Meter Works.
Reynolds Gas Regulator Co.
Sprague Meter Co.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Hammers
Ingersoll-Rand Co.

Hanger, Meter
Mueller Co.

Hangers, Iron and Steel
Baker Iron Works.

Heaters
C. B. Babcock Co.
Baker Iron Works.
C. F. Braun & Co.
The Estate Stove Co.
General Gas Light Co.
Magic Way Company.
New Way Mfg. Co.
Pacific Gas Heating Co.
Payne Furnace & Supply Co.
Welsbach Company.

Heaters, Floor
General Gas Light Co.
Magic Way Company.
Payne Furnace & Supply Co.

Heaters, Wall
C. B. Babcock Co.
General Gas Light Co.
Magic Way Company.
Payne Furnace & Supply Co.

Heat Exchangers
Baker Iron Works.
C. F. Braun & Co.
Southwestern Engineering Corp.
J. A. Campbell
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Heat Interchangers
C. F. Braun & Co.
Southwestern Engineering Corp.
J. A. Campbell
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Hoists
Ingersoll-Rand Co.

Holders
The Bartlett Hayward Co.
Baker Iron Works.

Holders, High Pressure
Baker Iron Works.
Western Pipe & Steel Co.

Hoppers
The Bartlett Hayward Co.

Hose, Air
Ingersoll-Rand Co.

Hot Plates
C. B. Babcock Co.
Johnson Gas Appliance Co.
Geo. D. Roper Corporation.

Hygrometers
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Incinerators
C. B. Babcock Co.
Baker Iron Works.
J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Incinerator Brickwork
J. T. Thorpe & Son, Inc.

Indicators
Westcott & Greis, Inc.

Instruments (Measuring, Testing and Recording)
Jensen Instrument Co.
Pacific Meter Works.
The Foxboro Co., Inc.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Insulating Materials
W. P. Fuller & Co.
Pioneer Paper Company.
Stockton Fire Brick Co.

Joint Runners Asbestos
Safety Gas Main Stopper Co.

Kilns
J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Kilns—Brickwork
The Bartlett Hayward Co.

Laboratory Supplies
Mueller Co.
Westcott & Greis, Inc.

Ladles, Hot Metal
Mueller Co.

Lamps
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Lighters
C. B. Babcock Co.
Tappan Stove Co.

Lighting Incidentals
C. B. Babcock Co.
Welsbach Company.

Line Pipe—Iron
South Chester Tube Company

Line Pipe—Steel
Amer. Seamless Tube Corp.
South Chester Tube Company

Linings—Brickwork
J. T. Thorpe & Son, Inc.

Linings—Car
Pioneer Paper Company.

Main, Bags
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mains, Street
United States Cast Iron Pipe and Foundry Co.

Main, Stopper
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mantles, Gas Lighting
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Manometers
J. A. Campbell
Jensen Instrument Co.
Lee B. Mettler.
Westcott & Greis, Inc.

Meters, Air
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Boiler
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Meters, Burner Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Cast Iron Gas
The Bartlett Hayward Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meter Connections
Lattimer-Stevens Co.
Pacific Meter Works
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Complaint
Pittsburgh Meter Co.
Pittsburgh Equitable Meter Co

Meters, Consumers
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Flow
The Foxboro Co., Inc.
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, Fluid
Jensen Instrument Co
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Gas
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Gasoline and Oil
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, High Pressure Distribution
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Pacific Meter Works.
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, High Pressure Iron Case
The E. A. Key Company
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Industrial Consumers
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, Iron Case
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Laboratory
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Large Capacity
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Oil
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Orifice
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Robinson Orifice Fitting Co.
Westcott & Greis, Inc.

Meters, Oxygen
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Oxygen and Hydrogen
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Prepayment
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meter Seals
Lattimer-Stevens Co.

Meter Shelves
Lattimer-Stevens Co.

Meter Swivels and Caps
Lattimer-Stevens Co.

Meters, Station
The Bartlett Hayward Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Meters, Steam
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Water
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, Wet Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Mixers, Gas and Air
C. B. Babcock Co.
Geo. D. Roper Corporation.

Oil Condenser Sections
Semet-Solvay Engr. Corpn.

Oil, Diaphragm
Pacific Meter Works.

Over Heat Control
The Wilcolator Company

Oxide
C. B. Babcock Co.
A. R. Maas, Laboratories.
Stauffer Chemical Co.

Packing, Asbestos
Safety Gas Main Stopper Co.

Paint
The Arco Company.
Everlasting Paint & Sales Co.
W. P. Fuller & Co.
Pioneer Paper Company.
Hill, Hubbell & Company.

Photometers
Pacific Meter Works.

Pilots
Payne Furnace & Supply Co.
The Wilcolator Company

Pipe
Amer. Seamless Tube Corp.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.
Western Pipe & Steel Co.

Pipe Compound
E. A. Key Co.

Pipe, Copper
Mueller Co.

Pipe Covering
Hill, Hubbell & Company.
Pioneer Paper Company.

Pipe Cutters
W. W. Strickler & Bros.

Pipe—Iron
South Chester Tube Company

Pipe—Steel
Amer. Seamless Tube Corp.
South Chester Tube Company

Pipe Coils, Bends, Van Stone Joints, Gasketless Flange Joints, Welded Nozzle Headers
Semet-Solvay Engr. Corpn.

Pipe Jointers
Mueller Co.

Plugs (testing mains and running service)
C. B. Babcock Co.
Jensen Instrument Co.
The Foxboro Co., Inc.
Safety Gas Main Stopper Co.
United States Cast Iron Pipe and Foundry Co.

Pre-Heaters
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Producers, Gas
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Provers, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Pumps
C. B. Babcock Co.
Ingersoll-Rand Co.
Mueller Co.
Oliver Continuous Filter Co.
Pacific Meter Works.
Geo. D. Roper Corporation.
Safety Gas Main Stopper Co.

Purifiers
Baker Iron Works.
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Purifying Materials
C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
A. R. Maas, Laboratories.
Stauffer Chemical Co.

Purifiers, Oil Absorption
Western Pipe & Steel Co.

Pyrometers (Indicating and Recording)
Jensen Instrument Co.
Westcott & Greis, Inc.

Radiants
C. B. Babcock Co.
General Gas Light Co.

Radiant Heaters
C. B. Babcock Co.
General Gas Light Co.
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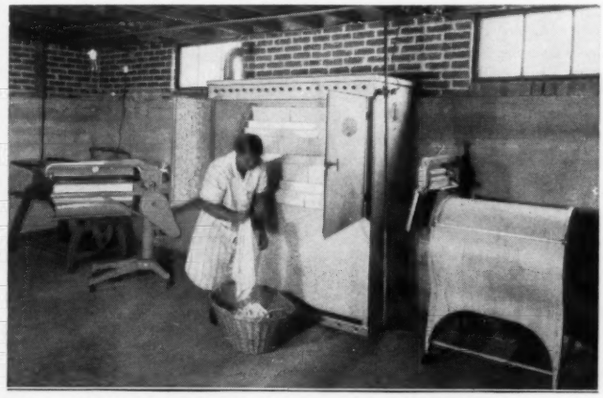

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Mueller Flat Head, Iron-Body, Brass-Plug Service Stop G-11100

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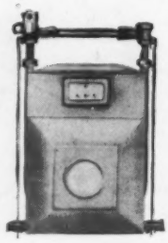

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